amateur radio

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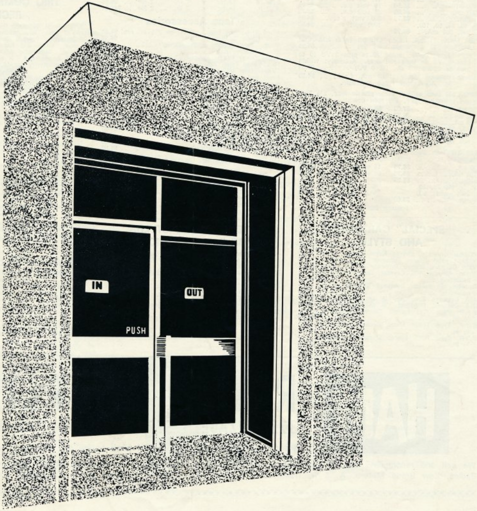

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D.C. Current: 0-30 uA., 1, 50, 500 mA., 10 A.
Resistance: 0-5, 500K ohms, 550M ohms.
Decibels: minus 20 to plus 22 db., plus 20 to plus 36 db.
Capacitance: 250 pF. to 0.02 uF.
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Meter Movement Internal Resistance: 3.100 ohm plus or minus 3 per cent.
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For D.C. Voltange range, plus or minus 3 per cent. of specified value.
For D.C. Current range, plus or minus 3 per cent. of specified value.
For A.C. Voltage range, plus or minus 4 per cent. of specified value.
For Resistance range, plus or minus 3 per cent. of scale length.
For Decibel range, plus or minus 4 per cent. of specified value.

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CONTENTS

Cover Story

"Open the door to 1969" is our theme for the first of "A.R's" new editorial style front covers. The illustration is an artist's impression of Radio Parts' Melbourne showroom main entrance, recently reconstructed as part of their "new look" for 1969. "A.R.," too, "opens the door" to all Amateurs with the promise of more technical news and articles during 1969.

SIDEBAND ELECTRONICS ENGINEERING

proudly presents the latest addition to the line of

YAESU-MUSEN Amateur Transceivers

the FT-200

SPECIFICATIONS—

- Band Coverage: 3.5-4.0, 7.0-7.5, 14.0-14.5, 21.0-21.5, and 28.0-30.0 Mc.
- Operating Modes: SSB, AM (A3h), CW.
- Power Limits: 240W. PEP on SSB/CW, 75W. on AM.
- IF and Crystal Filter: 9 Mc.
- VFO Frequency Range: 5.0-5.5 Mc.
- Maximum VFO Drift: Under 100 c.p.s. after 20 minutes warm-up.
- Output Impedance: 50 to 120 ohms, non-reactive.
- Carrier Suppression: Better than —40 db.
- Sideband Suppression: Better than —50 db. at 1,000 c.p.s. modulation.
- Distortion Products: Better than 25 db. down.
- Audio Range: 300-2,700 c.p.s. ± 3 db.
- Receiver Sensitivity: 0.5 microvolt for 10 db. S/N ratio.
- Filter Characteristics: —6 db. at 2.3 Kc., —60 db. at 4.0 Kc.
- Audio Output, Receiver: 1 Watt into 8 or 600 ohm load.
- Power Supply: External, 12V. DC or 240V. AC.
- Size: 13" x 5½" x 11".
- Weight: 16 lbs.
- VOX and Calibrator: Internal, standard equipment.
- Further Details: R.I.T. receiver incremental tuning, and built-in speaker.
- Valve Line-up: 12AX7 mic. amp., 7360 bal. mod., 12AU7 carrier osc., etc., 12BY7 driver, two 6JS6s final amp.

It will be a few more months before this beauty will be available ex stock, but no doubt worth waiting for at the estimated total landed cost, S.T. included, of only $375. What is more, the set is also planned to be available in KIT FORM!!! A copy of the circuit diagram of the FT-200 is already available for one dollar, postpaid.

Other YAESU MUSEN units now in stock:

FL-DX-2000 Linear, $250. FR-DX-400 Receiver, $375. FL-DX-400 Transmitter, $375. FT-DX-400 and the FT-DX-100 Transceivers: New supplies of these are sailing, but at my prices they are already sold before they have landed!

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A General Coverage High Frequency Converter

R. A. MURPHY, VK5ZDX, and R. S. GURR,† VK5RG*

THE authors have for some time been entirely satisfied with the various converters they have built for the high frequency bands—a multiplicity of these units, used in conjunction with Command Receivers, etc., with a 3 to 6 Mc. tuning range, have proved so satisfactory that it was decided to build two composite converters that would include all the desirable features of the originals. An article in "A.R." for April 1960 describes one of these converters. The composite versions would eliminate plugging co-axial cables in and out each time a band was changed, and produce an overall economy of power supplies.

Deliberation over the proposed development confirmed that the most suitable basic receiver to accompany the converter was one with a range of 3 to 6 Mc., as both possessed this version of the Command series, and if the idea was of interest to any other Amateur, the construction or duplication of a tuner covering this range would not be difficult. In each case the Command Receivers have been considerably modified to provide additional selectivity, s.s.b. detection, etc.

* 274 Diagonal Road, Oaklands Park, S.A., 5046.
† 9 Richmond Avenue, Daw Park, S.A., 5041.

Two similar cabinets were constructed and both units, when completed, achieved the same results but by alternative means. The final range possible with the original combination was 3 to 30 Mc., however VK5ZDX has now expanded his range to cover 0.5 to 30 Mc.

CRYSTAL OSCILLATOR

During development serious consideration was given to an idea offered by VK5KS of using one 6 Mc. crystal and its harmonics as the local oscillator in the converter. Tests confirmed the loss of far too much spectrum in the immediate vicinity of 6 Mc. on all ranges, although the use of higher grade shielding and double tuned circuits in the frequency multiplier section may have reduced this considerably.

This problem was overcome with the use of alternative harmonics of crystals that were not in the tuning range of the main receiver. These were chosen to allow the progressive ranges 3-6, 6-9, 9-12, . . . 27-30 Mc.

R.F. TUNING CIRCUITS

For economy of coils, two basic preselector tuning ranges are used prior to the mixer, and the approx. 2 to 1 tuning range of these is accomplished by two entirely different methods as

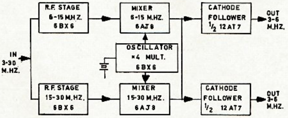


FIG. 1. BLOCK DIAGRAM VK5RG CONVERTER.

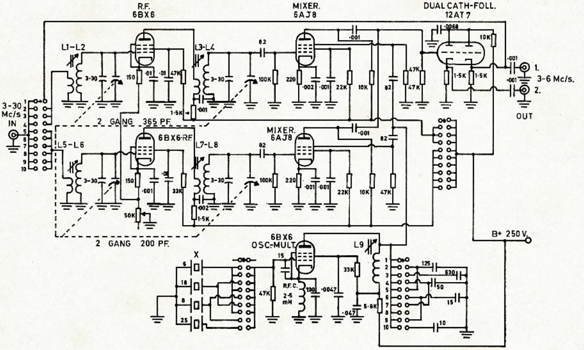


FIG. 2. 3-30 M.HZ.- CONVERTER - VK5RG.

detailed in the following description. The novel method of mounting the switch wafers and using a detachable long shaft was stolen from "A Side-band Package" by W6TEU in "QST" June 1958.

VK5RG CONVERTER

Two entirely separate r.f. and mixer stages are used, with the crystal oscillator feeding both mixers. The outputs of the mixers are fed to a cathode follower which feeds to the low impedance output sockets. Each front end has its own two-gang condenser and associated coils, slugs and trimmers, and covers 6-15 and 15-30 Mc. respectively. Aerial input, oscillator and output switching are arranged via a 4-bank 12-position wafer switch. High tension to the unused mixer/r.f. section is disconnected on one wafer.

Valve types and circuitry used were due to these being the most satisfactory in the developmental converters, besides being on hand, and resort to "like new" mixers and cascode r.f. stages was not therefore considered. The inclusion of the power supply as an integral part of the converter was considered desirable, as the unit could then be used in conjunction with any receiver desired, and thus demonstrated in any shack of those interested in its duplication.

The basic block diagram is shown in Fig. 1 and the circuit in Fig. 2.

The main dial of this converter tunes only the 15-30 Mc. condenser, and for dial economy the 6-15 Mc. gang is driven by a "Meccano" chain and sprocket set, so in effect we have a four-gang condenser, each two gangs beings dissimilar in capacity. Obviously, since we have two separate r.f. ends it is not necessary to track all four gangs.

Coil details are not supplied as the later version (VK5ZDX) uses similar types. Fig. 3 indicates the ranges, oscillator frequencies, etc.

Pos.	R.F. Range Mc.	Crystal Mc.	Oscillator Mc.	Rx Tuning Range Mc.
1	3-6	—	—	3-6
2	6-9	6	12	6-3
3	9-12	6	6	3-6
4	12-15	18	18	6-3
5	15-18	6	12	3-6
6	18-21	8	24	6-3
7	21-24	18	18	3-6
8	24-27	6	30	6-3
9	27-30	8	24	3-6
10	22-21	8.333	25	4-3
	28-29	8.333	25	3-4

Fig. 3.—Crystal and Oscillator Frequencies, VK5RG Converter.

OPERATION

Operation is simple—the range switch is set as required, the receiver set to the appropriate i.f., and the r.f. circuits peaked up for maximum signal. This technique is similar to that required in "Racal" and similar receivers and the "two hand" tuning technique is no worse than the "Racal" method, where four separate knob rotations are required for any major frequency change. As the 3-6 Mc. receiver at VK5RG has instant switching of series and shunt padders to allow 3-4 Mc. bandspread, a tenth band position allows a greater bandspread on 10 and 15 metres.

Two outputs which are isolated from each other are available to allow tuning two frequencies on the one range, e.g. WWV on 15 Mc. and the 14 Mc. Amateur band; or 21.54 Mc. Radio Australia and the 21 Mc. Amateur band. This feature is handy when working Americans above 14.2 Mc. and monitoring of your transmit frequency below 14.2 Mc. is desired. Of course it is necessary to possess a second 3-6 Mc. receiver to do this.

VK5ZDX CONVERTER

Lessons learned with construction of the VK5RG converter showed that the following specifications could be incorporated in a more refined version:—

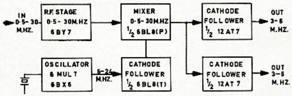
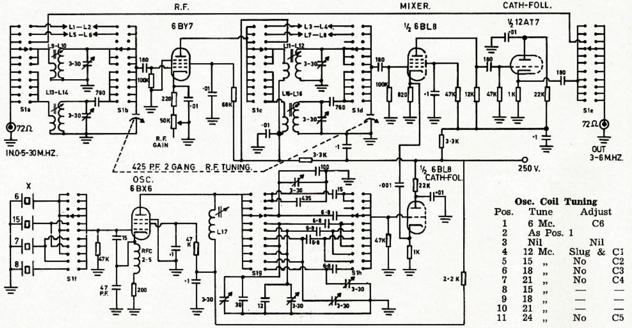


FIG. 4. BLOCK DIAGRAM VK5ZDX CONVERTER.



Osc. Coil Tuning

Pos.	Tune	Adjust
1	6 Mc.	C6
2	As Pos. 1	
3	Nil	Nil
4	12 Mc.	Slug & C1
5	15 „	No C2
6	18 „	No C3
7	21 „	No C4
8	15 „	— —
9	18 „	— —
10	21 „	— —
11	24 „	No C5

S1A-H Wafer Switch Assy. 8 Bank x 11 Position

FIG. 5. 0·5-30 M.HZ.- CONVERTER.- VK5ZDX.

1. Expansion to include ranges lower than 3 Mc.
2. Single two-gang condenser using switched multiple coils and trimmers in the r.f. tuner.
3. Provision for adjusting oscillator injection for optimum.
4. Use of alternative valves.

The only apparent disadvantage is the need for a number of additional 12-position wafer switch banks. The block diagram is shown in Fig. 4.

coverage receivers, but gives one an assurance that the front end is actually selective. The inclusion of a 3 to 1 vernier drive in each converter makes this adjustment simpler.

Full details of circuit, coil details and chassis layout are given in Figs. 5, 6 and 7 respectively.

GENERAL

Cabinets are simple aluminium chassis with front and back panels of same material—flanges on these panels allow use of expanded aluminium sheet to form sides and top covers and give the structure a measure of mechanical stability.

Muting is possible by a switch on the front panel which opens the power transformer centre tap (circuit not shown, but standard).

Since the normal two-gang condenser was never intended for use on common r.f. frequencies, watch out for the earthing fingers that are normally situated between the gangs. These must be good and thoroughly clean so that the rotor shaft is kept at earth potential otherwise instability will result.

Crystals are standard DC11 and FT243 types and no trouble was encountered in getting any of them going. The 15 pF. feedback condenser between the cathode and the grid of the 6BX6 may need to be modified in value depending on the quality and size of the r.f.c. in the cathode. We used in one case a standard 2.5 mH. size and the other a 150 microhenry. A tip here is to use a standard 1 watt high value Philips resistor and wind to about twice the diameter with about 30 s.w.g. enamel wire, soldering the ends of the wire on to the brass caps of the resistor; a much cheaper r.f.c. for this class of service than obtainable over the counter.

CONCLUSION

The writers believe they have constructed two complete and useful pieces of equipment that could be duplicated by any S.w.l. or Amateur. Parts are conventional and can be varied to suit the particular junk box. Correspondence from those interested in duplicating will be welcomed. Where a reader may have a junk box with the basic parts, practical assistance in the form of suggested layout, alternative valves, etc., is also offered, should this be required.

L1-L2, L3-L4:
Tunes 0.5 to 1.5 Mc. (Standard b.c. aerial and r.f. coils).

L5-L6, L7-L8:
Tunes 1.5 to 3.0 Mc.

L9-L10, L11-L12:
Tunes 6 to 15 Mc.

L13-L14, L15-L16:
Tunes 15 to 30 Mc.

Tuning Ranges

Switch Pos.	Command Rx Mc.	Xtal Freq. Mix. Mc.	R.F. Tune Mc.
1	5.5-4.5	6	0.5-1.5
2	4.5-3	6	1.5-3.0
3	3-6	straight thru	3-6
4	6-3	12	6-9
5	6-3	15	9-12
6	6-3	18	12-15
7	6-3	21	15-18
8	3-6	15	18-21
9	3-6	18	21-24
10	3-6	21	24-27
11	3-6	24	27-30

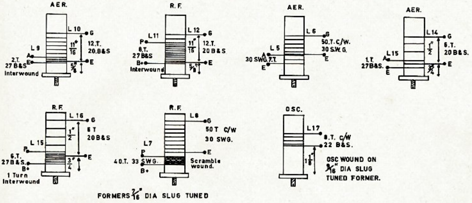


FIG. 6. COIL ARRANGEMENT.

OSCILLATOR CIRCUIT

Direct capacitive coupling from the oscillator/multiplier valve to the mixer grid was used initially, but the detuning effect when the mixer gang was tuned throughout its range made the level of injection unreliable, which resulted in varying sensitivity over the bands. The final solution was to incorporate one of the manufacturers' recommendations and use cathode injection to the mixer, and this required the inclusion of the 6BL8 triode as an impedance transformer.

Selection of the oscillator coupling condensers was at first by trial and error, but when finally completed and operational it was found that it was not necessary to have the multiple 6.8 pF. coupling condensers—one only plus the elimination of the extra switch wafer would be in order.

R.F. MIXER CIRCUIT

The coupling between aerial and r.f. grid coils, and plate and mixer coils, was given many hours of attention and the values shown are the best to date. Suggestions as detailed by G2DAF in his R.S.G.B. "Communications Receivers" for the interstage coupling techniques were studied, but as the preselection required in this article only covered Amateur bands, the inductive coupling method which has been universally accepted, was used. In determining coupling values, any compromise between gain and selectivity was always decided in favour of selectivity, as further protection against spurious responses.

These responses are minimal, and the repeated need for re-peaking of the preselector dial is perhaps onerous to those accustomed to wide range general

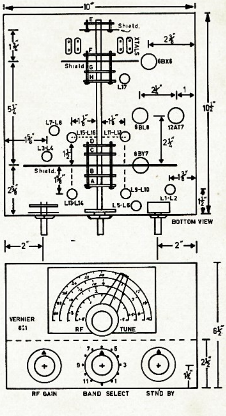


FIG. 7 COMPONENT LAYOUT - VK5ZDX.

PROJECT—SOLID STATE TRANSCEIVER

PART THREE

H. L. HEPBURN, VK3AFQ, and K. C. NISBET,† VK3AKK*

ORGANISATION

Before proceeding to the detailed description of another module, time will be spent on some non technical aspects of the project. At the time of writing (last November 1968) well over a hundred enquiries about the project have been received—and answered. Since the rate of receipt of these enquiries has not slackened, it is probable that the number will have doubled by the time this article appears in print. The following points appear to be those on which additional information has been sought.

PARTICIPATION

Once a module has been described in these pages—and not before—it is available by writing to one of the authors (VK3AFQ's address below) stating the requirements and enclosing the appropriate remittance. The cost of each module, or, if applicable, the various options, is given in the text as that module is described. The project is open to anyone.

In view of the size of the project, and, further, that development and organisation are spare (!!) time activities for those concerned, it was not possible for all circuit boards to have been drawn up and available, for all instructions to have been written, typed and duplicated, or for all circuit diagrams to have been printed before the first article in the series appeared. It is anticipated that the complete basic project will have been covered by the April/May 1969 issue of "A.R." and, at that time, all units will be available.

CABINET WORK

More than enough people have indicated their requirement for the cabinet and associated metal work to be made available. Accordingly, this is being organised and it is anticipated that by mid March next full details of the cabinet, and the cabinets themselves, will be ready—watch "A.R." for this.

TIME SPAN OF PROJECT

One of the fundamental points of a project such as this is that it be kept "open" for as long as possible. This ensures that participants can make up modules as time and money permit without any fear of missing out because of any restriction on the life of the project.

It is the present intention to keep this project open for at least two years. Even after this time, latecomers may be assured that kits and boards can be obtained.

DELIVERY

Delivery of kits not containing crystals is normally a week. Where kits contain crystals, delivery is normally 3-4 weeks since crystals are only ordered as required.

In the event that temporary "out of stock" situations arise with suppliers (and this might well be the case during this holiday period), which cause major variations from the stated delivery times to occur, then participants affected will be notified individually.

TESTING FACILITIES

Notwithstanding that the whole project needs but a minimum of test equipment to get it going properly, it has been decided that a lining up and checking service will be organised. Apart from the postage involved, there will be no charge for this service. But there must, in all fairness, be some stipulations attached to it. It is felt reasonable to confine this free service to **complete** transceivers, transmitters or receivers that have been made exactly to specification using kits obtained through the project. A moments reflection will suffice to show that it would be very difficult to include hybrid jobs (part project, part commercial module, part junk box type!) or modified jobs or those containing "improvements".

QUERIES

If, prior to taking part in the project, or at any time during it, there are any points which are obscure, or require assistance, then it is hoped that would-be or actual participants will write, putting the problem to the writers. Every effort will be made to assist.

THE I.F. MODULE

Only one module will be described this month—the i.f. module—but, since it contains at least three functions, some time and space will be devoted to its operation.

Reference to Fig. 9, the circuit diagram, shows that the module contains a two-stage amplifier using integrated circuits, a diode detector for a.m. and a.g.c. feed, an a.m. noise limiter and an a.g.c. voltage generator.

I.F. AMPLIFIER

T1 is a tuned circuit on 9 Mc. which feeds a Motorola MC1550G integrated circuit. The I.C. is used as a series cascode amplifier in a common emitter, common base configuration. A.g.c. is applied to this stage but the current sinking a.g.c. facility of the chip is not used.

T2 is a double tuned circuit on 9 Mc. whose prime function is to reduce the overall noise bandwidth of the i.f. amplifier. Whilst taps are used on the two halves of T2 to present the correct input and output impedances to the two I.C's, it would have been possible, with an increase in overall noise level, to take the output of the MC1550G straight into the second I.C.—a Fairchild uA719C.

As a matter of interest the Fairchild uA703 can be used in the same circuit as the MC1550G if the difference in base configuration is accommodated.

The second I.C.—the uA719C—uses triple cascoded emitter coupled amplifiers in a high gain circuit. An additional amplifier on the chip is not used, but its associated connections are brought out to P.C.B. pins on the board for use, if needed, at a later stage.

The gain of the amplifier is such that a 1 microvolt signal is detectable. A.g.c. action commences at approximately 8-10 microvolts input to give an a.g.c. rail which swings between 9-10 volts under small signal conditions and 1 volt at maximum signal input.

SIGNAL RECTIFICATION

Before proceeding with the detail of operation of the detection/a.g.c. systems, readers are asked to bear in mind that in any silicon transistor or silicon diode there is a voltage drop between base and emitter or between anode and cathode. With silicon devices this drop approximates to 0.5v. and, in the description that follows, will be called V_{BE}. (Perhaps this terminology will make the purist frown a bit when applied to diodes, but it's much simpler to use the one description.)

Output from the uA719C is applied to the detector diode D1 via the 0.01 uF. coupling capacitor. D1 is forward biased to approximately 2.6 volts positive with respect to earth by the 22K tab. pot and the two 10K resistors associated with it.

Under no signal conditions the V_{BE} drop across D1 gives a cathode voltage of about 2.1 volts positive, which is also the base voltage of Q1. Again the V_{BE} drop across Q1 brings its emitter potential to about 1.6 volts positive.

When an unmodulated signal is applied to D1, it is rectified and filtered by the combination of the 1K resistor and the two associated capacitors. The resulting DC voltage is then effectively in series with the fixed anode voltage of D1. Thus the base of Q1 will be at some new voltage above that obtaining under no signal conditions, the actual increase being proportional to the signal applied to D1. If now modulation is added to the signal the base of Q1 will vary around the new mean DC level at an audio rate.

The emitter of Q1 will also vary around a mean DC level at an audio rate, but, because of V_{BE} the mean DC level will be about 0.5 volt under that at the base of Q1.

Note that the mean DC levels at all these points will be proportional to the carrier level applied to D1.

Having thus explained the conditions obtaining at the emitter of Q1, let us follow the three separate paths which branch out from it:

(a) The a.m. (with N/L) path.
(b) The a.m. (no limiting) path.
(c) The a.g.c. system feed path.

NOISE LIMITER PATH

Assume that there is an a.m. signal at the emitter of Q1—that is that the emitter is varying around some mean

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DC level at an audio rate. Let this mean DC potential be "e" volts. Assume further that the N/L diode, D5, is not in circuit. Audio cannot go through the N/L path since it is effectively bypassed to ground by the 50 uF. capacitor. The DC potential at point "X" will, however, be the same as at the emitter of Q1, i.e. "e" volts. Assume further that the slider of the 1.5K tab pot is adjusted to give it a voltage slightly less than 0.5 below "e" volts. If D5 is now replaced, it will be suitably forward biased into conduction and an a.m. signal path now exists through D5 to the "audio N/L out" point.

Now let a noise spike come from the emitter of Q1. It will be positive going (the negative going pulse having been stopped by D1) and will **instantly** reverse bias D5 into non conduction. The delay introduced by the 50 uF. condenser and the two associated 6.8K resistors will prevent the voltage at the anode of D5 rising at the same rate. The effect is thus to block off D5 for the duration of the spike.

The above explanation takes certain liberties and ignores secondary effects, but does serve to explain the action of the noise limiter.

THE A.M. (UNLIMITED) PATH

As before, the emitter of Q1 is varying at an audio rate and straight capactive coupling will give an audio output at the off-take point.

To give roughly the same a.m. audio output at both the limited and unlimited output points, the 2.2/2.2K divider network has been introduced, since the loss across the noise limiter circuitry is approximately 50%.

THE A.G.C. SYSTEM

The a.g.c. system used in this design is somewhat unconventional and, apart from its application in this project, may be of a more general interest.

Conventional a.g.c. systems derive a voltage which is proportional to the signal level and apply it back to the emitters or bases of individual transistors with each path being individually engineered.

In the system to be described, which has been used very successfully by the authors and others in the Melbourne area, the method used is to derive an "h.t." voltage which is inversely proportional to the signal. Application of a.g.c. thus becomes simply a matter of feeding individual stages, or a whole board, from a common rail. Within limits, simple transfer of an h.t. feed point from an uncontrolled rail to the controlled rail is all that is required to apply a.g.c.

Reverting to the circuit diagram and assuming no signal conditions, Q2 and Q3 are turned off and the collector of Q3 is at supply rail potential. Q4 is an emitter follower and, again under no signal conditions, its emitter is about 0.5 volt below the supply rail because of the V_{BE} drop.

The 47 ohm resistor in the collector of Q4 has been included to prevent the sudden demise of the device should the emitter be accidentally shorted to ground. A side effect of this resistor is slightly to upset the DC voltage conditions assumed in this description, but this secondary effect will be ignored in the interests of simplicity.

Note too that the V_{BE}'s of D2, D3, D4, Q2 and Q3 are effectively in series and amount to some 2.5 volts.

If now a signal appears at the emitter of Q1 (no matter whether it be a.m., s.s.b., c.w. or any other mode), the mean DC level of the Q1 emitter will rise as explained above. When this DC level exceeds the V_{BE}'s of D1, 2, 3, Q3 and D4, then Q2 and Q3 will be switched on, Q3 will start to draw current, its 4.7K collector load will drop voltage and the collector DC voltage will drop to a value below the h.t. supply rail. The emitter of Q4 will follow this drop and, in fact, because of V_{BE} again, will be about 0.5 volt less than Q3's collector. Thus the a.g.c. rail connected to the emitter of Q4 will rise and fall according to the strength of the signal applied to the diode detector D1.

The "threshold" of the a.g.c. system is adjusted by means of the 22K tab pot which sets the DC conditions of D1.

The preferred "instant attack—slow decay" characteristics of a present day a.g.c. system are conferred by Q2 and the three large capacitors in its emitter circuit.

Q2 is used as an emitter follower and, when switched on by a signal, provides a low impedance path instantly to charge up whichever of the three large condensers (50 uF., 320 uF. or 1,000 uF.) are earthed. When the signal is removed, these condensers cannot discharge back through Q2 but must discharge (relatively slowly) through Q3 and its emitter resistor.

The 50 uF. condenser is permanently connected to earth to provide the quickest decay rate and the 320 uF. or 1,000 uF. condensers can be selected by a front panel control to give two additional decay rates.

If a.g.c. "on/off" facilities are required a simple switch, which transfers the device feed point between the controlled and uncontrolled rails, is all that is required.

Like all high gain circuits, the layout of the i.f. strip herein described is critical. Considerable experimental work has gone into this particular unit to evolve a layout which is both reproducible and free from instability.

(Continued on Page 25)

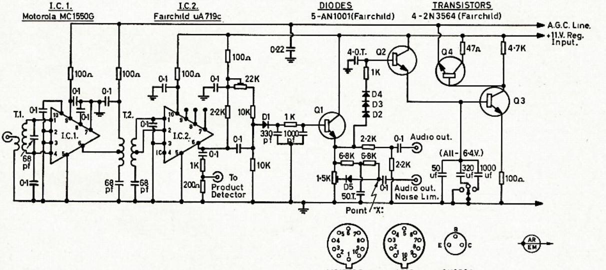


FIG. 9.-4 BAND TRANSISTOR RECEIVER-I.F. STRIP.

SEMI CONDUCTOR BASE CONNECTIONS.

T1—Secondary is 40 turns of 33 B. & S. wire on Neosid type former, fitted with F29 slug. Primary is 10 turns of 33 B. & S. wire over cold end of secondary.

T2—Primary and secondary, 40 turns of 33 B. & S. wire, tapped 10 turns from cold end, on Neosid type formers, fitted with F29 slug. Coils mounted 15/32 inch apart.

S.S.B. Transmitter—An Amateur Engineering Project

PART FOUR

H. F. RUCKERT, VK2AOU*

ADDITIONAL DESIGN FEATURES

Cooling Blower: One can use a protective cover which has more holes than metal to allow air flow and cooling of under and above chassis components, but it does not take long for a dust layer to cover everything. Together with high air humidity, this dust can cause considerable trouble and sets which are just about filled with components are difficult to clean effectively.

A good fan or blower costs money and takes some chassis room. The blower motor should have no brushes, which cause radio interference, must be large enough to move sufficient air without having to run too fast, which would cause too much running and hissing air noise. Excessive noise in the shack would mask weak signal reception, causes a modulation background, and may even trigger the vox circuit, putting the transmitter on the air.

The blower installed fulfills the mentioned requirements. Air enters the blower through a three-layer fly wire mesh screen and fills the below chassis compartment of the p.a. From here one third of the air goes through a number of holes in the bottom cover of the p.a. housing, guided by a sponge plastic ring with whistle noise preventing wire mesh in between, and through correspondingly placed holes of the underneath standing exciter lid. The exciter cover has holes at the sides and rear and also in the bottom plate.

Two thirds of the air is forced from the p.a. under chassis room up through three rings of holes which surround the valve holders of the p.a. valves. Corresponding holes are in the p.a. lid top. In this way a strong air flow goes along the valve envelopes. Additional holes are in the side and rear of the p.a. housing cover. This blower keeps the transmitter temperature at about half the temperature (°C.) it would reach without the blower. This means that sensitive components like diodes, electrolytic capacitors, mains transformers and valves will last much longer in summer.

A.L.C. Circuit: This is actually a voltage level delayed a.g.c. circuit operated by a portion of the r.f. voltage taken from the exciter output terminal. An adjustable diode counter bias can be set in such a way that the a.l.c. will only become effective if the drive voltage exceeds a certain value. With the 100K ohm resistor this level can be from no a.l.c. action to a value which allows only 60% of the maximum drive to be applied.

The a.l.c. is not used to compensate the gain differences which occur when the bands are changed, in order to prevent distortion, it is more a means to prevent overdriving the p.a. Working on four valves, the action is very effective with only a few volts applied.

Netting: The transmitter can be tuned up on a received frequency without turning the p.a. on. The netting switch S2a unbalances the ring modulator resistors via a small relay to obtain a carrier signal on the desired frequency. Audio is disconnected from the ring modulator by a stand-by relay contact pair. The —50v. blocking voltage is removed from the a.l.c. line with switch S2b, and the gain of the four valves can be manually selected with the 100K ohm netting level control.

Some r.f. is getting into the receiver first mixer via the commonly used crystal oscillator and the v.f.o. can be tuned to zero beat the received frequency. The tuning has to be made from one side, or the sharp receiver crystal filter makes the beat note inaudible. The p.a. remains off with the screen grid voltage disconnected by an aerial relay contact.

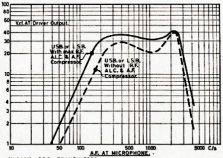
Driver Tuning and Output Meter: It was found very handy to have a tuning indicator for the exciter during experiments with the exciter and when tuning the exciter after far-going frequency changes, before the p.a. is turned on and tuned. A small voltage is taken from the exciter output terminal, rectified and fed to a transistor. The power was insufficient to operate and match the 1 mA. 50 ohm meter, but the transistor d.c. amplifier solved this problem. With the help of this meter, one can see the detuning and driver loading effect the grid to cathode space charge of the p.a. valves has on the driver and its tank circuit.

Other Meters: The combined grid current, if some should occur, of the p.a. valves is always monitored by a 1 mA. meter, which is useful when conducting experiments and to check the operating conditions to prevent flat topping.

One meter was installed to act as multimeter to measure all other p.a. operating conditions:

(a) Cathode current of each of the three valves separately.
(b) The screen grid voltage (two selectable values).
(c) The control grid bias (adjustable).
(d) The combined screen grid current and stabiliser action.
(e) The h.t. plate voltage.

The switch S6a and S6b selects also the necessary shunts and dropping resistors.

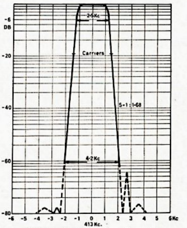


VK2AOU. S.S.B. TRANSMITTER.

FINAL TESTS

The exciter was set up with a 1:4 capacitive voltage divider of 60 pF. total capacity, taking the place of the p.a. input circuit. The capacitive loading mentioned earlier may be substituted by a resistor causing a similar r.f. voltage drop at the exciter plate.

An audio signal generator was used to obtain the a.f. input voltage (replacing the mike) and the resulting s.s.b. exciter output voltage was measured with the r.f. probe of a v.t.v.m. The graph shows the result for l.s.b. and u.s.b. operation, both with and without 50% compressor action. The a.l.c. was turned off to avoid a lift of the lower a.f. frequencies by limiting the stronger higher a.f. frequencies.



INPUT AT FILTER Vs. EXCITER(DRIVER) OUTPUT.

We see that the compressor had—as intended—very little effect on the a.f. response. The 2 Kc. wide flat top of the crystal filter shows up, and the a.f. response is practically the same for l.s.b. and u.s.b. transmission.

It appears from these curves that the bass part is too much suppressed, but playing back the operator's voice of a recorded transmission showed clearly that the earlier used carrier frequencies, which were closer to the crystal filter pass band, resulted in less intelligibility due to the rather low pitched voice of the operator and the strong bass response of the dynamic microphone. These effects, together with a slight bass lifting action of the a.l.c., made it necessary to adjust the carrier

crystals to be 500 c/s. outside the —6 db. filter frequency points, as shown on the abovementioned filter response curve.

One can also pick up with the mike a voice radio transmission which is rebroadcast by the s.s.b. transmitter, received with the station receiver and the b.c. signal is compared with the s.s.b. signal. This shows quickly how much intelligibility is lost in the s.s.b. rig. For this test, a suitable dummy load has to be used.

Next the complete transmitter was tested, working into a low s.w.r. dummy load of 52 ohms (Heath Cantenna). The output can be measured with a series connected r.f. thermocouple amp. meter,[8] but one should remember that many of these amp. meters are only correct within a limited frequency range not necessarily 3.5 to 30 Mc.

The other way is to connect a suitable r.f. volt meter to the dummy load[9] ($P = 0.5\ E_{DC}^2 \div R$). The audio source was the tape recorder playing back a pre-recorded 800 and 1,800 c/s. steady signal (double tone) from the speaker to the transmitter mike. The new legal maximum power of 200 watts average = 400w. p.e.p. output was obtained without grid current on the 80 to 15 metre bands and slightly less on 10 metres. The mains voltage has some effect as will be expected.

This transmitter can be left running under these conditions for several hours which permits many experiments to be made. With the steady input signal (double tone) flat topping occurs as soon as grid current flows, because a higher average screen grid current causes the U_{s2} regulator to cut out. This does not happen with speech modulation and occasional grid current pulses of 0.7 mA. The a.l.c. and a.f. compressor can keep things under control very easily.

With the transmitter working into the dummy load and transmitting the pre-recorded voice of the op., it is interesting to check with the station receiver (r.f. overload must be carefully prevented) the transmitted bandwidth, the carrier and unwanted sideband suppression. The suppression of the unwanted sideband is mainly a function of the filter curve and the a.f. frequencies which are transmitted. 200 c/s. are far less suppressed than 2 Kc. This transmitter needs between —60 db. points a 4.2 Kc. bandwidth, as already indicated by the filter curve.

COMMENT

There are many different approaches or circuits available to achieve similar results or better ones. Finer points will be changed and more refinements added as time goes on, because re-sale value has not to be considered. This Amateur engineering project taught the writer many interesting and useful details about electronics. With a small financial outlay, a considerable amount of time—reserved for a home study hobby—and with mainly those parts collected over the years, a fine piece of equipment was completed.

[8] W3HTF, "QST," December 1965.
[9] "Amateur Radio," December 1966.

THE 122-SSB AND POWER SUPPLIES

R. D. CHAMPNESS, VK3UG*

Many Amateurs probably have an old trusty 122 gathering dust in the corner of the shack. This set, built during the Second World War, before s.s.b. became really known, and hence isn't a dream to use in an s.s.b. net, as probably many may have found out. Many of the shortcomings of this set in this regard can, however, be minimised and I find my set now is quite pleasant to operate with s.s.b. stations as well as a.m. stations.

Many articles on 122s have been published in "A.R." over the years and reference to these is most enlightening. I have done the various modifications as seen fit and did a few of my own. An increase of power never goes amiss and with the power supply described in May 1967 issue of "A.R." I was able to increase a.m. input from 12 watts to 28 watts on 240 volts. This supply works well and I have included in this article a modified version of the l.t. section which I find very effective and with replacement of the 120 ohm and 180 ohm resistors in the AC128 base supply with a potentiometer of 500 ohms, the voltage can be varied between about 5 volts and 15 volts at up to 2 amps. A simple effective supply with low ripple and fairly good regulation. For use in the 122, the l.t. d.c. supply should put out 12.5 volts.

Having solved the power supply problem, the in-built problems of the 122 had to be solved. The b.f.o. control, as any operator of a 122 knows, is a horrible concoction. This was replaced with a single moving plate condenser connected to the grid of the b.f.o. valve. Operation is now very smooth and only a slight touch up of the b.f.o. slug is necessary. The leads which went to the rheostat are taped out of the way.

The tuning of the 122 is pretty direct, so a 5:1 reduction drive was fitted and now it tunes like one of the latest s.s.b. rigs.

For some aerials there is not enough capacity switched in by the aerial selector switch, so in B position I wired another 140 pF., and in C I added another 100 pF., and it is now much easier to load on some aerials.

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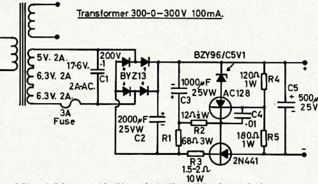
To do this mod. involves removing the r.f. transformer and then the switch assembly, fitting wires to the various switch lugs and in my case extending them to a tag strip on the side of the r.f. transformer so that any additional capacity wired in can be easily altered to suit the aerial.

Now having completed all that, the nastiest problem of them all had to be solved—that of getting accurate netting. The 122 has an in-built arrangement which switches in a compensating trimmer to correct any difference in frequency caused by the difference in operating conditions of the v.f.o. in net and transmit conditions. The h.t. is about 50 or so on net and about 250 on transmit. Unfortunately, in my case, the compensating capacitors C31A and C31B, even at minimum capacity, were too large and I had to cut them out of circuit. I changed the value of the 6U7G screen resistor and with no compensation I can net to within about 200 cycles. Not as close as I would like, but not too bad. The screen resistor in my case was increased to 47K ohms.

Having completed these modifications, I find the set quite good in its performance, considering what it is and the standards demanded these days. The only defect still left is the very broad i.f. response, which on mine means strong stations spread over about 17 Kc. I am attempting to obtain a 4 kc. filter for the i.f. which could give the old girl even longer life yet.

There is a certain amount of frequency shift with modulation and some s.s.b. transmitters are not free of this either, but the amount is not excessive. C.w. on 40 does, however, get reports of chirp, but even so, it isn't the worst c.w. signal on the band.

If you're not overloaded with the chips and have a 122, well why not join the s.s.b. boys with an a.c.-ised and s.s.b.-ised version?



R4 and R5 varied for use with 122 to obtain 12 to 12.5 volts on load.
Replace R4 and R5 with a 500 ohm potentiometer for variable voltage.
BYZ13s need 1½ inch sq. heat sink each. 2N441 a Ferris 7000 heat sink. AC128 a flag type heat sink.

Trade Review

H.M.V. "KIMBERLEY"

This review is the result of a suggestion received from one of our readers. The "Kimberley" is a transistor portable receiver and the fact that it covers from 525 Kc. to 30 Mc. decided us to approach E.M.I. (Australia) Ltd. and request that a unit be made available for our evaluation. This they did, and also supplied a service manual and other literature. Our findings are based on intermittent use over a fortnight.

The receiver as received by us was in original factory packing, the outer container being a strong fibre-board carton, the unit itself being sealed in a polythene envelope. The carton also contained about 20 feet of wire complete with plug for use as an external aerial, and about 4 feet of wire for earthing purposes. A guarantee and instruction book were also included.

An earpiece was in a leather pouch strapped to the carrying handle of the receiver.

The overall dimensions of the receiver are 12" long, 7" high and 3¼" deep. Front panel controls are dial light switch, tone, earpiece socket, fine tuning control and band switch. A combined on/off switch and volume control are on the left hand end while the main tuning knob is on the right hand end. The sloping top panel accommodates dials for the broadcast band with Australian stations all marked and a frequency scale.

A separate dial covers the three high frequency bands calibrated in megacycles with 500 Kc. points marked. A separate logging scale is incorporated and the various bands in which small ships and Flying Doctor services can be found are colour coded.

The telescopic aerial projects through the right hand end of the top panel. The general appearance of charcoal grey plastic with aluminium tril is extremely attractive.

Removal of the back panel reveals a 7" x 4" oval speaker, a most impressive bandswitch assembly and a 6" x 2" printed circuit board holding the i.f. and audio sections. A good sized battery (Eveready type 276-P) supplies the necessary 9 volts. The tuning mechanism is cord driven, the cord also driving the pointers for the dials. A circuit diagram and layout sketch is attached to the inside of the back panel.

On our unit, both pointers were approximately 1/8" away from the zero point on the dials, and checking b.c. stations showed the error to be present over the whole dial. Checking the s.w. bands against a 500 Kc. crystal oscillator showed the same error to be present, indicating the driving drum to be incorrectly located on the tuning capacitor. The service manual does not give any information on this adjustment, so we left it as it was found.

The frequency ranges are:

525	to	1620 Kc.
1.6	to	4.8 Mc.
4.6	to	14.0 Mc.
14.0	to	30.0 Mc.

The intermediate frequency is the normal 455 kc. Battery drain at zero audio output was found to be 12 mA., well within the manufacturer's specification. The audio output is quoted at 500 mW. approximately, and although not checked, we found it adequate for normal listening.

Nine transistors and two diodes are used as follows: BF115 r.f. amp., 2N3646 osc., SE1010 mixer, AX1202 1st i.f., BF185 2nd i.f., AY1110 a.f. amp., SE6002 audio driver, AC187 AC188 matched pair audio output, OA90 audio detector and an AB1101 a.g.c. detector.

The service manual suggests that sensitivity and distortion tests be made by listening, and this was the method we adopted. Performance on the broadcast band was more than adequate, in fact staggering in the evenings, many country and interstate stations being heard at comfortable level using the in-built loopstick as the only aerial. Using the telescopic aerial, a quick run was made over the Amateur bands. 160 metre portables 80 miles away were copied without trouble. Interstate stations on 80 and 40 metres were readable with the gain turned well up. A large amount of illegal 27 Mc. activity was monitored at good strength, but as these types do not make their locations public knowledge, they were of little help in our tests. No outpost services (i.e. Flying Doctor, etc.) were heard, but considering their low power and locations this was not surprising. Overseas commercials were easy copy.

Further tests were run, using a 50 ft. length of wire for an aerial. As a comparison the station receiver (an American communications job) was also fitted with a long wire. Anything audible on the station receiver was also audible on the "Kimberley", but the problem was to resolve the sideband stations. This was overcome by using the transmitter v.f.o. to supply a carrier, not ideal but effective. As was expected, the bandpass of the i.f. strip is too broad to separate the stations in the Amateur bands, but even so a large number could be copied. The fine tuning (a 1-3 pF. capacitor across the oscillator) was essential to resolve the sideband. Without an r.f. control, some overloading was noticed on s.s.b. signals, and it was necessary to reduce the coupling to the aerial.

Purely from curiosity, the "Kimberley" was operated alongside two imported receivers of similar specifications, but lacking the tuned r.f. stage. The r.f. stage really showed its worth, many stations being copied which were barely audible on the receivers lacking this facility.

In summing up, we give high marks for appearance and finish, the use of a speaker of reasonable size, and a battery of large capacity. For the purposes for which the receiver was designed the performance is first class. The instruction book is well written in language "the man in the street" can understand, and includes a list of Australian broadcasting stations, domestic shortwave services and a list of times and frequencies of overseas stations transmitting programmes in English to Oceania. The guarantee is usual for this type of equipment.

Years of experience with all geared tuning mechanisms and slow motion vernier dials, has left us with a jaundiced view of cord-driven systems. While no doubt adequate for the broadcast band, they leave a lot to be desired on the higher frequencies. Undoubtedly the designer had similar ideas, and added the fine tuning facility. It was money well spent.

If any low marks are to be awarded, they go to the fact that tuning and volume control knobs have to be removed before the back cover can be taken off, but this is a minor point.

The "Kimberley" is not a communications receiver, and no claims are made in that direction. It does what it was designed to do and does it well. W.I.C.E.N. operators wishing to monitor fire-fighting frequencies and S.w.l.'s in particular will be interested in this receiver. A small outboard b.f.o. is easily and cheaply constructed, and with the projected change to s.s.b. by Flying Doctor and maritime services to commence in 1970, to say nothing of the vast number of Amateur stations using this mode of transmission, such an accessory is highly desirable.

We suggest that anybody contemplating the purchase of a portable receiver would be well advised to have a look at the "Kimberley". It retails at $96.

SILENT KEYS

It is with deep regret that we record the passing of the following Amateurs:

VK2DE—Phil Renshaw.
VK5QT (ex VK2BM)—
H. F. (Fred) Treharne.
VK2 Associate—
W. H. (Bill) Clark, Ll.B.

NEW STANDARDS FOR B.C. STATIONS

The Australian Broadcasting Control Board has determined new standards for the technical equipment and operation of medium frequency broadcasting stations.

Mr. Myles Wright, Chairman of the Board, said that the new standards have been framed in the light of technical developments in the broadcasting field and experience in the application of the original standards.

Mr. Wright added that prior to determining the new standards, the Board took into consideration comments on the draft of the standards invited from a wide range of interested parties in the broadcasting industry—both Government and commercial sections. The draft had been the subject of favourable comment from many quarters.

The new standards are considerably more comprehensive than the previous standards and particular attention has been given to their form of presentation and layout with a view to simplifying reference to them in day to day operations. The outstanding feature of the new standards is the greater detail in which requirements in respect of equipment performance and operation are treated, including the addition of new material concerning methods to be observed in setting up equipment for the conduct of performance measurements as well as explanatory notes relevant to the actual measurement of equipment performance. The Board believes that the new standards represent a valuable contribution towards the further improvement of the technical quality of the medium frequency broadcasting service.

The standards have been issued to broadcasting stations and other sections of the industry directly concerned with them.

AUSTRALIAN DX CENTURY CLUB AWARD

OBJECTS

1.1 This Award was created in order to stimulate interest in working DX in Australia and to give successful applicants some tangible recognition of their achievements.

1.2 This Award, to be known as the "DX Century Club" Award, will be issued to any Australian Amateur who satisfies the following conditions.

1.3 A certificate of the Award will be issued to the applicants who show proof of having contacted one hundred countries, and will be endorsed as necessary, for contacts made using only one type of emission.

REQUIREMENTS

2.1 Verifications are required from one hundred different countries as shown in the Official Countries List.

2.2 The Official Countries List will be published annually in "Amateur Radio" and will be amended from time to time as required. Should a country be deleted from the Countries List at any time, members and intending members will be credited with such country if the date of contact was before such deletion.

2.3 The commencing date for the Award is 1st January 1946. All contacts made on or after this date may be included.

OPERATION

3.1 Contacts must be made in the H.F. Band (Band 7) which extends from 3 to 30 Mc., but such contacts must only be made in the authorised Amateur Bands in Band 7.

3.2 All contacts must be two-way contacts on the same band. Cross band contacts will not be allowed.

3.3 Contacts may be made using any authorised type of emission for the band concerned.

3.4 Credit may only be claimed for contacts with stations using regularly-assigned Government call signs for the country concerned.

3.5 Contacts made with ship or aircraft stations will not be allowed, but land-mobile stations may be claimed provided their specific location at the time of contact is clearly shown on the vertification.

3.6 All stations must be contacted from the same call area by the applicant, although if the call sign is subsequently changed, contacts will be allowed under the new call sign providing the applicant is still in the same call area.

3.7 All contacts must be made when operating in accordance with the Regulations laid down in the "Handbook for the Guidance of Operators of Amateur Wireless Stations" or its successor.

VERIFICATIONS

4.1 It will be necessary for the applicant to produce verifications in the form of QSL cards or other written evidence showing that two-way contacts have taken place.

4.2 Each verification submitted must be exactly as received from the station contacted, and altered or forged verifications will be grounds for disqualification of the applicant.

4.3 Each verification submitted must show the date and time of contact, type of emission and frequency band used, the report and the location or address of the station at the time of contact.

4.4 A check list must accompany every application setting out the details for each claimed station in accordance with the details required in Rule 4.3.

APPLICATIONS

5.1 Applications for membership shall be addressed to the Federal Awards Manager, Box 2611W, G.P.O., Melbourne, Vic., 3001, accompanied by the verifications and the check list with sufficient postage enclosed for their return to the applicant, registration being included if desired.

5.2 A nominal charge of 25c, which shall also be forwarded with the application, will be made for the issue of the certificate to successful applicants who are non-members of the Wireless Institute of Australia.

5.3 Successful applicants will be listed periodically in "Amateur Radio". Members of the D.X.C.C. wishing to have their verified country totals, over and above the one hundred necessary for membership, listed will notify these totals to the Federal Awards Manager.

5.4 In all cases of dispute, the decision of the Federal Awards Manager and two officers of the Federal Executive of the W.I.A. in the interpretation and application of these Rules shall be final and binding.

5.5 Notwithstanding anything to the contrary in these Rules, the Federal Council of the W.I.A. reserves the right to amend them when necessary.

AUSTRALIAN V.H.F. CENTURY CLUB AWARD

OBJECTS

1.1 This Award has been created in order to stimulate interest in the V.H.F. bands in Australia, and to give successful applicants some tangible recognition of their achievements.

1.2 This Award, to be known as the "V.H.F. Century Club" Award, will be issued to any Australian Amateur who satisfies the following conditions.

1.3 Certificates of the Award will be issued to the applicants who show proof of having made one hundred contacts on the V.H.F. bands, and will be endorsed as necessary, for contacts made using only one type of emission.

REQUIREMENTS

2.1 Contacts must be made in the V.H.F. Band (Band 8) which extends from 30 to 300 Mc., but such contacts must only be made in the authorised Amateur Bands in Band 8.

2.2 In the case of the authorised bands between 30 and 100 Mc., verifications are required from one hundred different stations at least seventy of which must be Australian. The Amateur Bands 50 to 54 Mc. and 56 to 60 Mc. will be counted as one band for the purposes of the Award.

2.3 In the case of the authorised Amateur Band between 100 to 200 Mc. and any authorised band between 200 to 300 Mc., verifications from one hundred different stations for each band is required.

2.4 It is possible under these rules for one applicant to receive three certificates, one for each of the authorised Amateur Bands nominated in Rules 2.2 and 2.3.

2.5 The commencing date for the Award is 1st June, 1948. All contacts made on or after this date may be included.

OPERATION

3.1 All contacts must be two-way contacts on the same band, and cross band contacts will not be allowed.

3.2 Contacts may be made using any authorised type of emission for the band concerned.

3.3 Fixed stations may contact portable/mobile stations and vice versa, but portable/mobile station applicants must make their contacts from within the same call area.

3.4 Applicants, when operating either portable/mobile or fixed, may contact the same station licensee, but may not include both contacts for the same type of endorsement.

3.5 Applicants may only count one contact for a station worked as a limited licensee with a Z call sign who is subsequently contacted as a full A.O.C.P. holder.

3.6 All stations must be contacted from the same call area by the applicant, although if the applicant's call sign is subsequently changed, contacts will be allowed under the new call sign providing the applicant is still in the same call area.

3.7 All contacts must be made when operating in accordance with the Regulations laid down in the "Handbook for the Guidance of Operators of Amateur Wireless Stations" or its successor.

VERIFICATIONS

4.1 It will be necessary for the applicant to produce verifications in the form of QSL cards or other written evidence showing that two-way contacts have taken place.

4.2 Each verification submitted must be exactly as received from the station contacted, and altered or forged verifications will be grounds for disqualification of the applicant.

4.3 Each verification submitted must show the date and time of contact, type of emission and frequency band used, the report and the location or address of the station at the time of contact.

4.4 A check list must accompany every application setting out the following details:—

- 4.4.1 Applicant's name and call sign, and whether a member of the W.I.A. or not.
- 4.4.2 Band for which application is made, and whether special endorsement is involved.
- 4.4.3 Where applicable, the date of change of call sign and previous call sign.
- 4.4.4 Details of each contact as required by Rule 4.3.
- 4.4.5 The applicant's location at the time of each contact if portable/mobile operation is involved.
- 4.4.6 Any relevant details of any contact about which some doubt might exist.

APPLICATIONS

5.1 Applications for membership shall be addressed to the Federal Awards Manager, Box 2611W, G.P.O., Melbourne, Vic., 3001, accompanied by the verifications and the check list with sufficient postage enclosed for their return to the applicant, registration being included if desired.

5.2 A nominal charge of 25c, which shall also be forwarded with the application, will be made for the issue of the certificate to successful applicants who are non-members of the Wireless Institute of Australia.

5.3 Successful applicants will be listed periodically in "Amateur Radio". Members of the V.H.F.C.C. wishing to have their verified totals, over and above the one hundred necessary for membership, listed will notify these totals to the Federal Awards Manager.

5.4 In all cases of dispute, the decision of the Federal Awards Manager and two officers of the Federal Executive of the W.I.A. in the interpretation and application of these Rules shall be final and binding.

5.5 Notwithstanding anything to the contrary in these Rules, the Federal Council of the W.I.A. reserves the right to amend them when necessary.

AUSTRALIAN D.X.C.C. COUNTRIES LIST

	Phone	C.W.
AC3—Sikkim		
AC4—Tibet		
AC5—Bhutan		
AP—East Pakistan		
AP—West Pakistan		
BV—Formosa		
BY—China		
CE—Chile		
CE9AA-AM, FB8Y, KC4AA-US, LA, LU-Z, OR4, UA1, VK0, VP8, ZL5, 8J—Antarctica		
CE0A—Easter Is.		
CE0X—San Felix		
CE0Z—Juan Fernandez		
CM, CO—Cuba		
CN2, 8, 9—Morocco		
CP—Bolivia		
CR3, 5—Portuguese Guinea		
CR4—Cape Verde Is.		
CR5—Principe, Sao Thome		
CR6—Angola		
CR7—Mozambique		
CR8, 10—Portuguese Timor		
CR9—Macao		
CT1—Portugal		
CT2—Azores		
CT3—Madeira Is.		
CX—Uruguay		
DJ, DK, DL, DM—Germany		
DU—Philippine Is.		
EA—Spain		
EA6—Balearic Is.		
EA8—Canary Is.		
EA9—Ifni		
EA9—Rio de Oro		
EA9—Spanish Morocco		
EA0—Spanish Guinea		
EI—Rep. of Ireland		
EL—Liberia		
EP—Iran		
ET3—Ethiopia		
F—France		
FB8W—Crozet Is.		
FB8X—Kerguelen Is.		
FB8Z—Amsterdam & St. Paul Is.		
FC—Corsica		
FG7—Guadeloupe		
FH8, FB8—Comoro Is.		
FK8—New Caledonia		
FL8—French Somaliland		
FM7—Martinique		
FO8—Clipperton Is.		
FO8—French Oceania		
FO8M—Maria Theresa		
FP8—St. Pierre and Miquelon Is.		
FR7—Glorioso Is. (from 25/6/60)		
FR7—Juan de Nova (from 25/6/60)		
FR7—Reunion Is.		
FR7—Tromelin		
FS7—Saint Martin		

	Phone	C.W.
FW8—Wallis and Futuna Is.		
FY7—French Guiana and Inini		
G, GB—England		
GC—Guernsey and Deps.		
GC—Jersey Is.		
GD—Isle of Man		
GI—Northern Ireland		
GM—Scotland		
GW—Wales		
HA, HG—Hungary		
HB—Switzerland		
HB0, HE—Liechtenstein		
HC—Ecuador		
HC8—Galapagos Is.		
HH—Haiti		
HI—Dominican Rep.		
HK—Columbia		
HK0—Bajo Nuevo		
HK0—Malpelo Is.		
HK0—San Andres & Providencia		
HL, HM—Korea		
HP—Panama		
HR—Honduras		
HS—Thailand		
HV—Vatican		
HZ, 7Z—Saudi Arabia		
I, IT—Italy		
IS1—Sardinia		
JA, JH, KA—Japan		
JT—Mongolia		
JY—Jordan		
K, KN, W, WA, WB, WC, WN—United States of America		
KB6—Baker, Howland and American Phoenix Is.		
KC4—Navassa Is.		
KC6—Eastern Caroline Is.		
KC6—Western Caroline Is.		
KG4—Guantanamo Bay		
KG6—Guam		
KG6I, KA1—Bonin & Volcano Is.		
KG6I, KA1—Marcus Is.		
KG6R, S, T—Mariana Is.		
KH6, WH6—Hawaiian Is.		
KH6—Kure Is.		
KJ6—Johnston Is.		
KL7, WL7—Alaska		
KM6—Midway Is.		
KP4, WP4—Puerto Rico		
KP6—Palmyra Group, Jarvis Is.		
KR6, 8—Ryuku Is.		
KS4—Swan Is.		
KS4B, HK0—Serrana Bank and Roncador Cay		
KS6—American Samoa		
KV4, WV4—Virgin Is.		
KW6—Wake Is.		
KX6—Marshall Is.		
KZ5—Canal Zone		
LA—Norway		

	Phone	C.W.
LA-G, 3Y—Bouvet Is.		
LA-P, JW—Svalbard		
LA-P, JX—Jan Mayen		
LU—Argentina		
LX—Luxembourg		
LZ—Bulgaria		
MP4B—Bahrein		
MP4D, T—Trucial Oman		
MP4M, VS9O—Sultinate of Muscat and Oman		
MP4Q—Qatar		
OA—Peru		
OD5—Lebanon		
OE—Austria		
OH, OF—Finland		
OH0—Aland Is.		
OK, OM—Czechoslovakia		
ON—Belgium		
OX, KG1, XP—Greenland		
OY—Faroe Is.		
OZ—Denmark		
PA, PE, PI—Netherlands		
PJ—Netherlands Antilles		
PJ—Sint Maarten		
PX—Andorra		
PY—Brazil		
PY0—Fernando de Noronha		
PY0—St. Peter and St. Paul's Rocks		
PY0—Trinidade and Martim Vaz Is.		
PZ1—Surinam		
SK, SL, SM—Sweden		
SP—Poland		
ST2—Sudan		
SU—Egypt		
SV—Crete		
SV—Dodecanese		
SV—Greece		
TA—Turkey		
TF—Iceland		
TG—Guatemala		
TI—Costa Rica		
TI9—Cocos Is.		
TJ, FE8—Cameroun		
TL—Central African Rep. (from 13/8/60)		
TN—Congo Rep. (from 15/8/60)		
TR—Gabon Rep. (from 17/8/60)		
TT—Chad Rep. (from 11/8/60)		
TU—Ivory Coast (from 7/8/60)		
TY—Dahomey Rep. (from 1/8/60)		
TZ—Mali Rep. (from 20/6/60)		
UA, UV, UW1-6, UN1—European Russian S.F.S.R.		
UA, UV, UW9, 0—Asiatic R.S.F.S.R.		
UA1—Franz Josef Land		
UA2—Kaliningradsk		
UB5, UT5, UY5—Ukraine		
UC2—White Russian S.S.R.		
UD6—Azerbaijan		
UF6—Georgia		
UG6—Armenia		
UI8—Uzbek		
UJ8—Tadzhik		
UL7—Kazakh		

	Phone	C.W.
UM8—Kirghiz		
UO5—Moldavia		
UP2—Lithuania		
UQ2—Latvia		
UR2—Estonia		
VE, VO, 3B, 3C—Canada		
VK—Australia		
VK2—Lord Howe Is.		
VK4—Willis Is.		
VK9, ZC3—Christmas Is.		
VK9—Cocos Is.		
VK9—Nauru Is.		
VK9—Norfolk Is.		
VK9—Papua Territory		
VK9—Territory of New Guinea		
VK0—Heard Is.		
VK0—Macquarie Is.		
VP1—British Honduras		
VP2A—Antigua, Barbuda		
VP2D—Dominica		
VP2G—Grenada and Deps.		
VP2K—Anguilla		
VP2K—St. Kitts, Nevis		
VP2L—St. Lucia		
VP2M—Montserrat		
VP2S—St. Vincent and Deps.		
VP2V—British Virgin Is.		
VP5—Turks and Caicos Is.		
VP6, 8P—Barbados		
VP7—Bahama Is.		
VP8—Falkland Is.		
VP8, LU-Z—South Georgia Is.		
VP8, LU-Z—South Orkney Is.		
VP8, LU-Z—South Sandwich Is.		
VP8, LU-Z, CE9AN-Z—South Shetland Is.		
VP9—Bermuda Is.		
VQ1—Zanzibar		
VQ8—Agalega and St. Brandon		
VQ8—Mauritius		
VQ8—Rodriguez		
VQ9—Aldabra		
VQ9—Chagos Is., Nelson's Is.		
VQ9—Desroches		
VQ9—Farquahar		
VQ9—Seychelles		
VR1—British Phoenix Is.		
VR1—Gilbert & Ellice Is., Ocean Is.		
VR2—Fiji Is.		
VR3—Fanning and Christmas Is.		
VR4—Solomon Is.		
VR5—Tonga Is.		
VR6—Pitcairn Is.		
VS5—Brunei		
VS6—Hong Kong		
VS9A, P, S—Aden and Socotra		
VS9K—Kamaran Is.		
VS9M—Maldive Is.		
VU—India		
VU4—Laccadive Is.		
VU5—Andaman and Nicobar Is.		
XE, XF, 4A—Mexico		
XF4—Revilla Gigedo		
XT—Voltaic Rep. (from 6/8/60)		

	Phone	C.W.
XU—Cambodia		
XW8—Laos		
XZ2—Burma		
YA—Afghanistan		
YI—Iraq		
YJ, FU8—New Hebrides		
YK—Syria		
YN, YN0—Nicaragua		
YO—Rumania		
YS—Salvador		
YU—Yugoslavia		
YV—Venezuela		
YV0—Aves Is.		
ZA—Albania		
ZB2—Gibraltar		
ZD3—The Gambia		
ZD5, ZS7—Swaziland		
ZD7—St. Helena		
ZD8—Ascension Is.		
ZD9—Tristan da Cunha & Gough Is.		
ZE—Rhodesia		
ZF1, VP5—Cayman Is.		
ZK1—Cook Is.		
ZK1—Manahiki Is.		
ZK2—Niue		
ZL—Auckland and Campbell Is.		
ZL—Chatham Is.		
ZL—Kermadec Is.		
ZL—New Zealand		
ZM7—Tokelaus		
ZP—Paraguay		
ZS1-6—South Africa		
ZS2—Prince Edward & Marion Is.		
ZS3—South-West Africa		
ZS8, 7P8—Lesotho		
ZS9, A2—Botswana		
1M—Minerva Reefs		
1S—Spratly Is.		
3A—Monaco		
3V8—Tunisia		
3W8, XV5—Vietnam		
3X, 7G—Rep. of Guinea		
4S7—Ceylon		
4U—I.T.U. Headquarters Geneva		
4W—Yemen		
4X, 4Z—Israel		
5A—Libya		
5B4, ZC4—Cyprus		
5H3, VQ3—Tanganyika		
5N2, ZD2—Nigeria		
5R8, FB8—Malagasy Rep.		
5T—Mauritania (from 20/6/60)		
5U7—Niger Rep. (from 3/8/60)		
5V—Togo Rep.		
5W1, ZM6—Samoa		
5X5, VQ5—Uganda		
5Z4, VQ4—Kenya		
6O1, 2, 6—Somali Rep.		
6W8, FF8—Senegal Rep. (from 20/6/60)		
6Y5, VP5—Jamaica		
7Q7, ZD6—Malawi		
7X, FA—Algeria		
8F, PK, YB—Indonesia (fr. 1/5/63)		
8R, VP3—Guyana		
8Z4—Saudi Arabia/Iraq Neut. Zone		
9A1, M1—Rep. of San Marino		
9G1, ZD4—Ghana (from 5/3/57)		
9H1, ZB1—Malta		
9J, VQ2—Zambia		
9K2—Kuwait		
9K3, 8Z4—Kuwait/Saudi Arabia Neut. Zone		
9L1, ZD1—Sierra Leone		
9M2, 4—West Malaysia (fr. 16/9/63)		
9M6, 8—East Malaysia (fr. 16/9/63)		
9N1—Nepal		
9Q5, OQ5, 0—Rep. of the Congo		
9U5—Burundi (from 1/7/62)		
9V1, VS1, 9M4—Singapore (prior to 16/9/63 or after 8/8/65 only. From 16/9/63 to 8/8/65 Singapore counts as 9M2—West Malaysia)		
9X5—Rwanda (from 1/7/62)		
9Y4, VP4—Trinidad and Tobago		
*—Blenheim Reef		
*—Geyser Reef		

* Since there is no apparent claim by any country to these reefs, no prefix will be shown. Confirmations for contact only after 4th May, 1967, will be accepted for D.X.C.C. credit.

DELETED COUNTRIES LIST

	Phone	C.W.
C9—Manchuria (prior 16/9/63)		
CN2—Tangier (prior 1/7/60)		
CR8—Damao, Diu (prior 1/1/62)		
CR8—Goa (prior 1/1/62)		
ET2—Eritrea (prior 15/11/62)		
FF8—Fr. West Africa (pr. 7/8/60)		
FI8—Fr. Indo China (pr. 21/12/50)		
FN—Fr. India (prior 1/11/54)		
FQ8—Fr. Eq. Africa (prior 17/8/60)		
I1—Trieste (prior 1/4/57)		
I5—It. Somaliland (prior 1/7/60)		
PK1, 2, 3—Java (prior 1/5/63)		
PK4—Sumatra (prior 1/5/63)		
PK5—Neth. Borneo (prior 1/5/63)		
PK6—Celebes & Molucca Is. (prior 1/5/63)		
UN1—Karelo Fin. Rep. (pr. 1/7/60)		
VO—Newfoundland (prior 1/4/49)		
VQ6—Brit. Somaliland (pr. 1/7/60)		
VS4—Sarawak (prior 16/9/63)		
VS9H—Kuria Muria Is. (prior 29/11/67)		
ZC5—Br. Nth. Borneo (pr. 16/9/63)		
ZC6—Palestine (prior 2/7/68)		
ZD4—Gold Coast, Togoland (prior 6/3/57)		
9M2—Malaya (prior 16/9/63)		
9S4—Saar (prior 1/4/57)		
9U5—Ruanda-Urundi (between 1/7/60 and 1/7/62 only)		

JOHN MOYLE MEMORIAL NATIONAL FIELD DAY CONTEST, 1969

SATURDAY, 1st FEBRUARY, 1969, TO SUNDAY, 2nd FEBRUARY, 1969

The Federal Contest Committee of the Wireless Institute of Australia invites all Australian Amateur and Short Wave Listeners to participate in this Annual Contest, which is held to perpetuate the memory of John Moyle, whose efforts advanced the Amateur Radio Service.

There are two divisions of this Contest, one of 24 hours continuous duration, and one of 6 hours continuous duration. The six-hour period has been included to encourage the operator who is unable to participate for the full 24-hour period.

Operators using 25 watts or less input to the final stage will be considered for a certificate where his activity warrants its issue.

DATE

From 0600 GMT, 1st February, 1969, to 0800 GMT, 2nd February, 1969.

OBJECTS

The operators of Portable and Mobile Stations within all VK Call Areas will endeavour to contact other Portable/Mobile and Fixed Stations in Australia and Overseas Call Areas.

RULES

1. There are two divisions, one of six (6) hours, and one of twenty-four (24) hours duration. The six-hour period for operating may be chosen from any time during the Contest, but the six-hour period so chosen **must** be **continuous.** In each division, there are six sections:—
   - (a) Portable/Mobile Transmitting, Phone.
   - (b) Portable/Mobile Transmitting, C.w.
   - (c) Portable/Mobile Transmitting, Open.
   - (d) Portable/Mobile Transmitting, Multiple Operation, open only.
   - (e) Fixed Transmitting Stations working Portable/Mobile Stations, open only.
   - (f) Reception of Portable/Mobile Stations.

2. All Australian Amateurs are encouraged to take part. Operators will be limited to their licensed power. This power shall be derived from a self-contained and fully portable source.

(a) Portable/Mobile Stations shall not be situated in any occupied dwelling or building. Portable/Mobile Stations may be moved from place to place during the Contest.

No apparatus shall be set up on the site earlier than 24 hours prior to the Contest.

All Amateur bands may be used, but no cross band operating is permitted. Cross mode operation is permitted.

Entrants in Section (d) for Multiple Operator Stations can set up separate transmitters to work on different bands at the same time. All such units of a Multiple Operator Station must be located within an area that can be encompassed by a circle not greater than half a mile diameter.

For each transmitter of a Multiple Operator Station a separate log shall be kept with serial numbers starting from 001, and increasing by one for each successive contact. All logs of a Multiple Operator Station shall be submitted by the operator under whose Call Sign the transmitters are working. No two transmitters of a Multiple Operator Station are permitted to operate on the same band at any time.

3. Amateurs may enter for any section.

4. One contact per station for phone to phone, also one for c.w. to c.w. per band is permitted. Cross mode operation will be accepted for scoring.

5. Entrants must operate within the terms of their licences and in particular observe the regulations with regards to portable operation.

6. Serial numbers consisting of RS or RST report plus three figures commencing with 001 and increasing by one for each successive contact shall be exchanged.

7. **Scoring—**

(a) **Portable/Mobile Stations:**

For contacts with Portable/Mobile Stations outside entrant's Call Area .... **15 points**

For contacts with Portable/Mobile Stations within entrant's Call Area .... **10 points**

For contacts with Fixed Stations outside the entrant's Call Area .... **5 points**

For contacts with Fixed Stations within the entrant's Call Area .... **2 points**

(b) **Fixed Stations:**

For contacts with Portable/Mobile Statons outside entrant's Call Area .... **15 points**

For contacts with Portable/Mobile Stations within entrant's Call Area .... **10 points**

8. The following shall constitute Call Areas: VK1, VK2, VK3, VK4, VK5, VK6, VK7, VK8, VK9 and VK0.

9. All logs shall be set out under the following headings: Date/Time (G.M.T.), Band, Emission, Call Sign, RST/No. Sent, RST/No. Received, Points Claimed. Contacts must be listed in numerical order.

In addition, there shall be a front sheet showing the following information:—

Name.......................... Address.......................

Call Sign.................. Section........................

Division.................. (6-hour or 24-hour)

Points Claimed..

Call Sign of other op./s (if any)...........

Location of Portable/Mobile Station.....

From................. hours to.................. hours

A brief description of equipment used, and points claimed, followed by the declaration:

"I hereby certify that I have operated in accordance with the rules and spirit of the Contest."

Signed................. Date.................

10. The right is reserved to disqualify any entrant who, during the Contest, has not observed the Regulations and the Rules of this Contest, or who has consistently departed from the accepted code of operating ethics.

11. The decision of the Federal Contest Manager of the Wireless Institute of Australia is final and no disputes will be entered into.

12. Certificates will be awarded to the highest scorer of each section of each division. Additional certificates may be issued at the discretion of the F.C.C. The six-hour certificates cannot be won by a 24-hour entrant.

13. **Return of Logs:**

All entries must be postmarked not later than **28th February, 1969,** and be clearly marked "John Moyle Memorial National Field Day Contest, 1969," and addressed to:—

Federal Contest Manager, W.I.A.,
Box N1002, G.P.O.,
Perth, W.A., 6001.

RECEIVING SECTION

14. This section is open to all Short Wave Listeners in VK Call Areas. The Rules shall be the same as for the Transmitting Stations, but may omit the serial numbers received.

Logs must show the Call Sign of the Station heard, the serial number sent by it, and the Call Sign of the Station being worked.

Scoring will be on the same basis as for Transmitting Stations. It will not be sufficient to log a station calling CQ. A station may be logged once only for phone and once for c.w. in each band.

Awards: Certificates will be awarded for the highest scorer in each Call Area.

Detecting V.h.f. Signals too Weak to be Heard*

PRACTICAL EQUIPMENT FOR MOONBOUNCE AND OTHER HIGH-LOSS PATHS

ALAN PARRISH, K1KKP

● Working with signals that are inaudible with normal v.h.f. receiving techniques has been a matter of long-time interest to the author of this article. In the hope of clarifying the somewhat vague information that has been available to Amateurs in the v.h.f. field, he presents details of a practical system capable of resolving signals at least 15 db. below the minimum that is detectable by aural methods.

GIVEN the Amateur power limit, there are two principal ways of overcoming the path loss on very marginal v.h.f. circuits. The more common of these is the use of large-aperture high-gain antennae. The second is to take advantage of unorthodox receiver designs, to obtain an effective bandwidth below the approximate limit of 100 cycles set by limitations on the human hearing mechanism and practical considerations of stability. From time to time mention is made in some Amateur journals of clever designs that claim to do this, usually under the name of "synchronous detection". The seemingly amazing claim is made that an effective bandwidth is achieved that is much smaller than the actual bandwidth of the receiver i.f., which normally determines the system stability requirements.

Such claims are not unfounded, nor is the principle of the system new. It has been employed in various scientific measuring instruments for some time. Here we will show how this principle is applied to a practical receiver that has been used to obtain moon echoes on 144 Mc. at K1KKP, using nothing more in the way of an antenna than two 10 element Yagis on 12-foot booms.

Many systems for detecting small signals in the presence of noise follow a development by R. Dicke in 1946.[1] This is based on comparing the total power (signal plus noise) in a narrow band containing the signal, with the noise power in the same band shifted so that the signal is not in it. In a superhet receiver this is done conveniently by shifting the local oscillator back and forth a few kilocycles. The comparison is made in a "synchronous" or phase-sensitive detector, following the envelope detector in the receiver. This amounts to nothing more than a reversing switch, operated periodically along with the frequency-shifting mechanism. A generalised representation of this system is shown in Fig. 1. Further discussion of the principles can be found in H. D. Olson's article in December, 1965, "QST".[2] An advantage of this approach is that it eliminates, on the average, any variations in the noise level, such as transients and variations in receiver gain.

The block diagram of a synchronous v.h.f. receiver is shown in Fig. 2. Here the frequency shifting is shown applied to the oscillator of a crystal controlled converter, although it can be done equally well at the main receiver oscillator. If it is done at the converter, the system can use a standard communications receiver, without modification, for most of the r.f. circuitry. This means that only the outboard equipment, shown in Fig. 3, need be built to make a synchronous receiver. In my case, this was largely built of junk box parts, and it could be transistorised easily.

PRACTICAL CIRCUIT DETAILS

There are a few special precautions that must be taken in construction, or in any re-design. At the top of the list is the need to keep any signal that is common to the reference and signal circuits at as low a level as possible, for it will register as a d.c. output, just like a received signal. Such d.c. "noise" can be balanced out in the d.c. amplifier, but its instability (resulting from line voltage variations, etc.), can be very troublesome when high d.c. gain and long integration times are used. It is best to eliminate this trouble at the source, with heavy decoupling of the plate supply leads and care in wiring heater circuits, to keep hum down. Otherwise no special care is called for in construction.

The phase sensitive detector performs the task of the reversing switch of Fig. 1, and is nothing more than a diode-ring balanced modulator. The 6AL5 diodes shown in Fig. 3 could be replaced with good grade semiconductors, if desired. To adjust the circuit, set R1 so that the voltages at J1 and J2 are equal, referred to ground. R2 and R3 are adjusted for minimum voltage from their arms to ground. These adjustments interact somewhat, and may have to be repeated a few times. Final balance is obtained by setting R1 for zero output from the d.c. amplifier, as read on the output meter, M1. A reference is obtained by shorting the d.c. amplifier input. Because of the high gain of the d.c. amplifier, this is the most sensitive indicator of balance. The adjustment is made with zero signal input from the receiver.

The 6AC7 pentodes were chosen for the d.c. amplifier in order to get high gain in a single stage, and avoid the inevitable problems associated with d.c. coupling of several triode stages. With this amplifier, integration times (T =

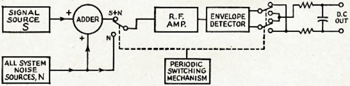


Fig. 1.—Basic principles of a Dicke-type receiver for weak-signal reception.

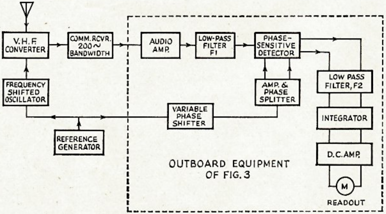


Fig. 2.—Block diagram of the weak-signal receiving system for v.h.f. work.

* Reprinted from "QST," January, 1968.

1 Dicke, "Measurement of Thermal Radiation at Microwave Frequencies," Rev. Sci. Inst., 268-275, July, 1946.

2 Olson, "Weak-Signal V.h.f. Reception," December, 1965, "QST," p. 25.

RC, where R and C are the integrator values) of up to half a minute can be used, if M1 is a 1 mA. meter or an Esterline Angus recorder. The stability of the system is such that it should be possible to use a 100 μA. meter and longer integration times, if desired. The r.f. filtering shown is needed only if the system is to be used for receiving your own echoes, to keep things from "running wild" when the transmitter is on, due to rectification in the grid circuit.

Relay K1 serves to isolate the integration capacitor, C7, during transmitting periods, allowing integration over several moon echoes. It is a normally closed type, opened during transmit periods by the same voltage that actuates the antenna relay. It is not needed except in "radar" service.

Constants of the LC filter in the input of the d.c. amplifier, preceding the integrator, are chosen to cut off sharply at a few cycles, in order to pass slow-speed c.w. No RC integrator is used following the filter in c.w. work. The 100 henry inductors, L1-L4, are large surplus high impedance audio transformers, with all windings connected in series-aiding. Some scrounging was needed to find these. If similar units cannot be obtained a cascaded RC filter could be made up instead, or it can be left out entirely if only long integration times are going to be used. Capacitors C1-C4 reduce the common mode noise present in the phase detector output. This will not show up in the readout if the d.c. amplifier is balanced, but this is not the case in practice.

The signal voltage applied to the phase detector (measured at J3) must be less than one-fourth of the reference voltage (measured at J1 and J2) to prevent overload. The output level from the phase detector can be maximised by limiting the bandwidth of the signal voltage from the receiver. This is done by the low-pass filter between the 6AV6 and 6J5 stages in Fig. 3, shown as F1 in Fig. 2. It should be possible to get about 20 volts across J1 and J2 without serious distortion of the waveform.

To get maximum signal-to-noise ratio, the signal and reference inputs to the phase detector must be exactly in phase. To adjust this a moderately strong signal is applied to the receiver, and the signals present at J1 and J3 are displayed in Lissajous-figure form on a scope. If zero phase shift cannot be obtained by adjustment of the phase control, it will be necessary to change the values of the coupling capacitors in the reference circuits, to obtain the proper range of phase control. Once this is done, adjustment can be obtained simply by adjusting the phase control for a peak in the output indicator.

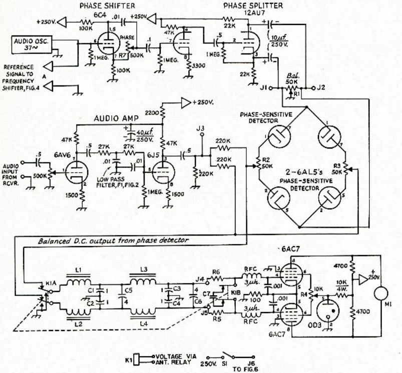


Fig. 3.—Schematic diagram of outboard equipment used to adapt a conventional v.h.f. receiving system for synchronous detection. Unless otherwise specified, decimal values of capacitance are in uF., others in pF. Capacitors with polarity marked are electrolytic. Resistors are ½-watt.

C1, C2, C3, C4—1 uF., 200 volts, paper.
C5, C6—4 uF., 200 volts, oil.
C7—Integration capacitor; for 10-second time constant 4 uF., 200 volts, oil. See text.
J1 to J6, incl.—Tip jack.
K1—4PDT relay, coil rating same as station antenna relay. Contacts are shown in the receive position.
L1, L2, L3, L4—100 hy.; see text.
M1—1 mA. meter, or chart recorder.
R1, R2, R3—50,000 ohm control, linear taper.
R4—10,000 ohm control, linear taper.
R5, R6—1.2 meg., for 10-second time constant; see text.
R7—0.5 meg., log taper.
S1—External contacts on antenna relay.

FREQUENCY SHIFTING

Details of frequency shifting circuits for variable and crystal oscillators are shown in Fig. 4. The upper circuit is used on my receiver, where the frequency shifting is done at the main variable oscillator. It cannot be used with a crystal oscillator. When the diode is forward-biased, the trimmer is effectively shorted across the tank,

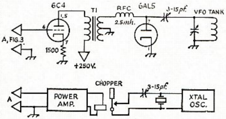


Fig. 4.—Typical frequency shifting arrangements for a variable oscillator, A, and crystal oscillator, B.

lowering its resonant frequency. Unfortunately the series resistance of the diode is enough so that it would lower the Q of a crystal, reducing the amplitude of oscillation; thus electromechanical switching must be used with a crystal oscillator, as in the lower circuit of Fig. 4. The Q of an LC tank is low enough so that the reduction due to the diode is not appreciable.

With the crystal oscillator a small audio amplifier drives a chopper (such as an Airpax No. 175) to handle the capacitor switching. Any amplifier should do, as only a few milliwatts of power are needed. This arrangement is used in the circuit blocked out in Fig. 2.

If the frequency shifting is done in the tunable oscillator of the receiver, the r.f. circuits in the receiver should be adjusted so that their response will be the same on both channels. Otherwise, slope detection of the noise will occur, and the balancing out of gain and noise-level variations will not be achieved. This point applies when shifting is done at the converter crystal oscillator, but the problem is not nearly as critical, for v.h.f. circuits are broadband by nature.

Some difficulty might be encountered as a result of changing drive level to the v.h.f. mixer, as frequency shifting occurs. This can be minimised by using a high crystal frequency to begin with. All these problems are aggravated if a large degree of frequency shift is used, and the optimum value seems to be around one or two kilocycles, for a 200-cycle i.f. bandwidth.

The fact that the post detection bandwidth in this system is very small does not mean that the predetection (or i.f.) bandwidth can be any desired value. Ideally it should be the same as the signal bandwidth, but this is not practical for c.w. signals. A bandwidth of the order of 200 cycles is probably about optimum, if stability problems are considered.

DETECTION AND READOUT

The only other special precautions concerning the communications receiver have to do with the detector. First, the r.f. drive level to the a.m. detector must be quite high, on the order of 10 volts, so that the detector nonlinearities in the forward region do not degrade the signal-to-noise ratio. At the same time, the drive level must not be so high that the last i.f. stage is saturated, as this would wipe off the amplitude information we are looking for. Also, since the desired signal is a low frequency (the same as the reference

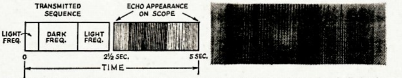


Fig. 5.—The trick in observing the presence of moon-reflected signals, when each individual echo is obscured by noise, is to code the transmitted signal, send a large number of identically-coded 2½-second pulses, and then "stack" the echoes electronically. Random noise is reduced by this averaging process, while the coded characteristics of the echo show through. The sketches at the left show the timing process. Stacking is done by intensity-modulating a scope with the receiver output. The scope has a 2½-second sweep triggered at the beginning of the echo. Actual moon echoes well below the audibility threshold are seen at the right. The transmitter is frequency-shift keyed, as described in the text.

frequency) the audio coupling circuitry must be able to pass it. This means that the audio to the 6AV6 stage in Fig. 3 should be coupled directly from the a.m. detector in the communications receiver, and not taken from the headphone jack.

The ideal readout device for this type of receiver is obviously a chart recorder. If one cannot be borrowed or scrounged, a meter can be used, but there is a tendency for the observer to apply wishful thinking when he is taking readings! I used a meter readout, and a 20-second integrator following the filter for moon-echo observations during the summer of 1965. For this work, a timer cycled the system between receive and transmit at 2½-second intervals, and disconnected the integration capacitor, C7 in Fig. 3, from the rest of the system while transmitting, so that any signal stored in it would not be lost. With this system it was possible to watch the sum of the echoes build up over many successive transmit-receive cycles.

Some sense of "just because the meter's moved over doesn't necessarily mean that there is a signal in there" remained; an ambiguity that could be resolved by coding the transmitted signal and then seeing if the code used is observed on a set of received echoes, which are combined together in the readout. The readout here is an oscilloscope intensity-modulated by the receiver output. The scope has a slow sweep initiated at the time the leading edge of the echo is expected. The combining is done by means of a time-exposure photograph of the scope face.

The synchronous receiver is sensitive to two frequencies separated by the amount of the local-oscillator frequency shift. A signal on one of these frequencies produces a net positive output of the phase detector, while a signal on the other results in a net negative ooutput. Thus, when the receiver output is fed to an intensity-modulated scope, a signal on one frequency makes the trace brighter, and on the other darker. This implies that the optimum way to code the transmitter output is by frequency-shift keying. In the case of Fig. 5 the transmitter was on the bright frequency at the beginning of the 2½-second transmit period, the dark frequency in the middle, and on the bright frequency again at the end of the period. Consequently, the readout time exposure is expected to be bright-dark-bright, from left to right.

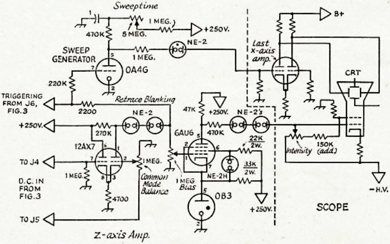


Fig. 6.—Schmatic diagram of the scope readout circuits. Actual circuit details of the scope, right side of broken line, depend on the scope used. Triggering and d.c. voltages taken from Fig. 3, are indicated at the left.

The coding and the transmit-receive cycle are controlled by a timing wheel, similar to the familiar "CQ wheel", and the code can be changed easily. It could be set up so that letters or words appeared on the readout in Morse code, and the system could be used for very slow-speed weak-signal communications, providing that the timing of the coding and the readout at the other end were properly synchronised.

The special circuitry needed to convert a standard scope to do this is shown in Fig. 6. This consists of a d.c. amplifier connected to the first grid of the c.r. tube through a string of neon bulbs, to effect the intensity modulation. The number of neons needed (only two shown in Fig. 6, for clarity) depends on the amount of high voltage used and the characteristics of the bulbs, and must be determined by experiment. The necessary slow sweep is obtained by the old fashioned gas-tube circuit, using an OA4G, also coupled into the scope.

In many scopes the last horizontal amplifier stage is directly coupled to the deflection plates. The output of the sweep circuit can be fed into the grid of this stage, through a single NE-2, as shown. The scope used here is an old Heath OL-1, which is representative of many inexpensive manufactured and kit instruments. The input to this equipment is taken from J4 and J5 in Fig. 3, and the retrace triggering from J6. This also provides retrace blanking, by forward-biasing the 6AU6 stage when the transmitter is on. A 60-cycle signal is applied to the vertical deflection plates, so that the sweep will be a wide band, instead of a narrow line.

A sample of the moon-radar results, as photographed from the scope, is shown in Fig. 5. The exposure was f5.6 for 250 A.S.A. film and 20 sweeps. The transmitter used was a 4CX250B amplifier, essentially as described by W0MOX in December, 1961, "QST," running 900 watts input. The converter was a Nuvistor job with a noise figure of about 3 db. The antenna system was small, by moonbounce standards, being only a pair of 10 element Yagis on 12-foot booms, fed with home-made open-wire line.

During all the observations, a Collins 75A1 with 200-cycle bandwidth, and a tape recorder, were used, in case there were audible echoes. None were heard during the whole observation period, though occasional bursts have been heard on a similar set-up in the past.

VERIFYING PERFORMANCE

The actual performance of the synchronous receiver is more easily checked in the laboratory than by moonbounce tests, though it is still difficult because of the very weak signals involved. I did not have access to a calibrated signal generator with adequate stability, so the device shown in Fig. 7 was constructed as a test source. It uses a 500 kc. crystal oscillator feeding a tuned circuit at 144 Mc. via a 1N34 as a harmonic generator. Output

from the harmonic generator is coupled to another tuned circuit in the other compartment of a 5" x 7" x 3" chassis by two triangular capacitor plates, 1" x 1½" in size.

The output connector is tapped half way down on the second tuned circuit, as shown in Fig. 8. The degree of coupling, and hence the output signal level, can be adjusted by moving the aluminium plate that separates the two compartments. The plate is held in position by a leaf spring arrangement, barely visible in the right portion of Fig. 7. The generator has no leakage, is very stable, and its output level can be adjusted smoothly down to zero, making it very useful in any kind of weak-signal receiver development work.

Tests with the generator indicate around 10 db. signal-to-noise ratio with 10 seconds integration time, when the signal has been reduced to the point where it can no longer be found in the receiver operated in the normal way with 200 cycles bandwidth. This serves to show what receiving equipment of this type will do, in terms of eliminating transients and variations in gain and noise level from the net output, allowing one to observe a very weak signal under less than ideal conditions. A 3 db. price is paid for this, as the signal is observed only half the time. This must be accepted when weak signal work is done with long integration times, as otherwise a slight change in noise will mask the signal.

A receiver of this type is obviously not an ordinary hamshack device, as it comes into its own only as the signal approaches inaudibility, yet its circuitry is no more complex than other modern equipment. Its chief usefulness is in propagation studies on e.m.e. or other high-loss paths. For such communications experiments it will indicate whether there is any signal coming in at all, when the signal is below audible level, and it will serve as a visual aid in copying very slow, weak c.w.

APPENDIX

The signal-to-noise ratio expected for the receiver described here can be calculated using the method developed by Dicke. The resulting formula is:

$$\frac{\text{signal deflection}}{\text{RMS noise deflection}} = \frac{P_{SIG}\sqrt{\gamma}}{K\,T_N\,\sqrt{B}\;2}$$

where—

P_{SIG} = coherent signal power at the antenna terminals.

K = Boltzmann's constant, $1.38 \times 10^{-23}\,\frac{\text{joules}}{\text{deg. Kelvin}}$

B = receiver i.f. bandwidth.

γ = RC, the integrator time constant.

T_N = system noise temperature, which is (N–1) 290° plus the antenna temperature. N is the noise figure expressed as a power ratio.

The factor of 2 in the denominator appears because the signal is observed only half the time. The formula also works for an ordinary receiver followed by an integrator, if the effects of gain variation, etc., are neglected. In this case, the factor of 2 is dropped.

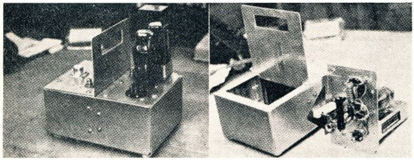


Fig. 7.—Weak-signal generator used for testing the receiving equipment. Output is varied by moving the vane shown at the centre of the assembly. The 500 kc. oscillator and voltage regulator tube are at the right side of the vane in the assembled view, left. The interior is shown at the right.

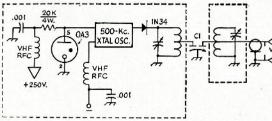


Fig. 8.—Schematic diagram of the signal generator of Fig. 7. The two tuned circuits should be set up for the frequency band to be used. Taps are at the approximate mid-points. Fixed plates of C1 are the two triangular coupling plates described in the text. The movable plate is the vane seen in Fig. 7.

Overseas Magazine Review

"QST"

October 1968—

Increasing the Accuracy of Frequency Measurement; VE3CUS. Roy Golding continues the subject begun in previous issues of "QST". I can hardly agree wholeheartedly with one of his statements regarding measurement accuracy in that one can begin with a modest 100 kc. or 1 Mc. crystal which is not fitted in an oven to control the dividers and end up with a very sophisticated oven controlled crystal with an aging rate better than 5x10¹¹/day.

Solid State Mobile/Fixed Converter for 1.8 Mc.; W1CER. This article follows on naturally from the article in September "QST" in which Doug described a 7-8 watt tx for this band.

Touch to Talk; KH6CU. The author obviously has something which suits his situation very well. I think I still have a couple of OA4s in the junk box. They are not OA4Gs though so I will not be able to appreciate the lavender glow.

A Simple Transmitter for the Beginner; W1TS. Using a 6C4 and 5763, Don runs 12-15 watts to the final on c.w. Perhaps a triode pentode such as one of those used so commonly in t.v. and audio work would allow only one tube to be used.

"Stovepipe"; WA8COT. Transmitting converters for 50 and 144 Mc. They start off from a transceiver on 28 Mc. and convert to the v.h.f. bands.

Perfect Teletype at Your Finger Tips; W2QYW. The author describes modifications to the keyboard morse machine he described in "QST" for August 1965.

Radiation Resistance of Inverted V Antennas; K4GSX. Covers the theory and practice of inverted vees (droopy dipoles) at various heights above ground and with included angles from 180 (no droop) to 90 degrees (45 degrees droop).

IVI; W0IP describes his transceiver which has been modified to give "instantaneous voice interruption". Phone break-in at its best!!!

Matching With Home Made Baluns; W5KTR describes modifications he made to his Hy-Gain beam to give him better performance. May have applications to beams other than Hy-Gain.

Recent Equipment. Hallicrafters SR-400 and HA-20 are reviewed.

"CQ"

September 1968—

Phones and Phone Patches; W5LHG. Discusses the development of telephone circuits and means of connection of radio equipment to telephone circuits. So far as is known this practice is illegal in Australia.

Signals from Satellites; W3ASK. Discusses earth satellite transmitting frequencies and methods of receiving their signals in the Amateur shack.

Vertical Antennas; W3JM. Capt. Lee continues the discussion which has been carried on in "CQ" in previous issues.

A Six Element Wire Yagi for 20; W8CLD. A fixed beam for 20 mx with figures for element lengths for various sections of the band.

Monolithic Crystal Filters; W2EEY/1. Discusses the latest crystal filter techniques, methods of obtaining various shape factors, etc. This type of filter does not lend itself to Amateur construction.

The Care of Ni-Cad Batteries; K6MVH. This type of power source is becoming very popular for portable equipment.

The SB-34 Transceiver—Expanded Coverage and Convenience; W2EEY/1. This article describes methods of modifying the transceiver to cover the whole of all bands, if required.

Antenna Theory in Practice; VE6TW. A useful article to have by for antenna experiments.

"CQ" Reviews the Knight Kit Solid State Signal Generators; W2AEF. So far as is known this range of equipment is not available on the Australian market.

"CQ" World Wide DX Contest C.w. and Phone Records. Could be of interest to DXers.

AMATEUR FREQUENCIES:

ONLY THE STRONG GO ON—
SO SHOULD A LOT MORE
AMATEURS!

THE QUESTIONNAIRE

Some Preliminary Observations

We firstly extend thanks to all those who have so far returned their questionnaires. The results are better than we had expected, the return so far exceeding 25%. Returns from the various States are approximately

VK1-2	22%	VK5-8	28%
VK3	34%	VK6	23%
VK4-9	30%	VK7	25%

Returns have been received from a wide cross-section of the Amateur fraternity if we can go by their spending, occupations and interests, and we believe our final analysis will prove to be accurate.

Many people answered the questions in much greater detail than we sought, but although this will involve us with extra work, it will add to the accuracy of our findings. Whilst many of the suggestions made are completely impracticable, we have, nevertheless, gained a lot of very useful information and proposals, some of which we are already acting on.

Two points have emerged most clearly, the first of these being the fact that some of our readers are still under the impression that they are paying 30 cents per copy, despite all the material that has been published on this matter since last Easter. For their benefit, and at the risk of boring others, we re-iterate that we receive **17 cents per copy** from the Divisions, this being the amount only since last May after the 2 cent increase was applied.

The second point is the fact that Divisional Councils and Federal Councillors were out of touch with the thoughts of the members when they refused the requested increase in the price of "A.R."

It is obvious from the questionnaire that members in general realise the necessity of paying a reasonable amount to get what they want in the magazine, and practically everybody wants a larger magazine. In 1933 the magazine cost 6d. Now 35 years later, the magazine is twice the size and the price is equal to a little over three times the price paid in 1933. Had the cost of "A.R." risen in proportion to all other costs in the last 35 years, well—you do your own calculations. The foregoing may appear irrelevant, but read on.

A frequent comment is that we should make payment, if only a token amount, for articles published. This is a matter that has been frequently discussed (see last month's Publications Committee report) and passed over through lack of funds. Another frequent suggestion is the appointment of a full-time paid staff. As the unpaid staff now spend nearly 200 hours a month on the magazine, it is obvious that at least a staff of two would be needed. The accumulated profits for the last 35 years, which supplies our present working capital, would not pay a man for six months. In short, to maintain the present standard, pay even a token amount for articles published, and have only one full-time employee for the magazine would add at a bare minimum of 10 cents to the price of each copy. Would it not be better to pay the extra for a larger magazine now. The final decision is yours, through your Federal Councillor's vote next Easter.

But back to the questionnaire. On first count, 65% or more of Amateur equipment is home-brew, obviously a good market for component manufacturers. By far the greatest number consider that advertising space should be in the range of 30% to 40%, much the same as we have now. Whilst we would wish to maintain this percentage, the economics of the proposition will have to be studied in detail before a final decision can be made.

The order of preference for technical articles looks like being a photo finish between antennae, transmitters and receivers. A very bad last will be audio equipment, which has polled well under 1% of the first preference votes.

The wanted features have supplied many surprises, not the least being the fact that some readers do not want technical articles. Divisional notes, always a bone for contention, are wanted by about 50% of readers, many stipulating conditions under which they are wanted. Those against, are in the main vehemently against.

The final portion of the questionnaire asked the name and address of anybody you would wish a copy of "A.R." to go to. We had expected possibly a hundred or so, but the result has proved overwhelming. Please do not expect us to get these away too soon. We will have many hours of work, just addressing wrappers, so this part of the project will have to wait until more urgent matters are finalised.

These have been preliminary observations only, the next few weeks will see much analysing of the answers and a more comprehensive report will be forthcoming next month. To those few who indicated their willingness to assist us in some manner, please do not despair. We will contact you early in 1969.

Additions to our Library

AMATEUR RADIO TECHNIQUES
J. Pat Hawker, G3VA.
Published by R.S.G.B.

The first edition of this book was published in 1965 under the title "Technical Topics for the Radio Amateur". This, the second edition, has only recently been published and undergone a change of title. The book contains 160 pages with a wealth of information supported by over 350 diagrams. Most of the main items have been drawn from the original edition, but there has been some re-writing and additions.

The book includes the following sections: Semiconductors, components and construction, receiver topics, oscillator topics, transmitter topics, audio and modulation, power supplies, aerial topics, fault-finding and test units.

Also incorporated is a list of i.f. frequencies of practically every communications receiver in common use. A comprehensive index completes the book.

We have no indication of the local price, but we estimate it to be about $2 a copy, and at a price in that vicinity it is a bargain too good to be missed.

Our copy direct from the publishers.

TRANSISTOR CIRCUIT GUIDEBOOK
Byron G. Wels
Published by Tab Books, U.S.A.

Here's a handy reference and guide to all types of solid-state circuits—how they work, where they're used, unusual features, etc.

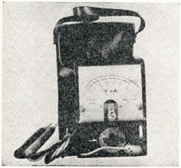
This is definitely not a primer on the solid-state art, but a collection of basic and advanced circuits, covering the principal fields of electronics. Each circuit is accompanied by a brief description of how it works, pointing out unusual features and applications. For experimenters and construction-minded readers there is enough information, parts lists, component specifications, coil data, etc., to enable them to actually build the circuit and get it operating. Amateurs and hobbyists will find many made-to-order circuits for the shack and home.

This big collection of 104 circuits includes AM/FM tuners and receivers employing transistors, FETs, and MOS FETs; amplifiers for stereo, telephone, public address; timers, time delays, temperature indicators, grid dip oscillators, special signal generators; power and speed controls, servo controls, heat controls; light flasher, SCR light switches and dimmers, light-activated switch; transceiver, wireless phono oscillator, sonobuoy transmitter, marine band transmitter, frequency doubler, FET VFO, linear RF amplifier; stereo balancer, intercom system, audio mixer; BFO, short-wave converter, noise limiter; automotive transistorised ignition system, battery charger; differential amplifier, shift register or ring counter, bistable multivibrator, decimal counter; power converters, inverters; electronic flash; and a complete color TV receiver circuit and parts list. 224 pps.

Our copy direct from the publishers. Price $US4.95 plus postage.

New Equipment

VERSATILE MULTIMETER "RAPAR" TESTER Model YT68A



A pocket size multitester branded "Rapar" has a meter sensitivity of 1,000 o.p.v. A magnet is mounted in the back of the case which enables the instrument to adhere to all steel surfaces. Carrying case and test prods are provided.

Specifications: DC volts: 0 to 10, 50, 250, 1,000. AC volts: 0 to 10, 250, 500. DC current: 0 to 250 mA. Resistance: 0 to 100K. Weight: 7 oz. Battery: 1.5v. Prince inc. sales tax: $9.

Further information from Radio Parts Pty. Ltd., Melbourne.

ADJUSTABLE GROUND PLANE AERIAL

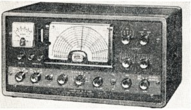
New from Belling & Lee is a series of adjustable ground plane aerials,
AGP1 adjustable from 70 to 85 Mc.;
AGP2 adjustable from 116 to 136 Mc.;
AGP3 adjustable from 149 to 172 Mc.

By simple adjustment of the ground plane radials, spacing from the base of the unipole, a precise match at any frequency within the specified bands can be obtained.

Constructed throughout from high grade aluminium alloy, and coated with polyurethane for weather protection.

Further information and technical leaflet from Belling & Lee (Australia) Pty. Ltd., Kilsyth, Vic.

GELOSO AMATEUR TRANSMITTER



Model G4/225 is a complete transmitter providing all the facilities for modern Amateur communications for c.w., s.s.b., d.s.b., and a.m. modes.

Features include crystal stabilised v.f.o., 160-200 watts p.e.p. on s.s.b., 80 metres through to 10 metres, 16 tubes with a pair of 6146 in p.a., 100% a.m. modulation, break-in keying for c.w., vox operation, netting switch, pi coupler output, and modualtion meter incorporated.

Amateur Prices: G4/225 transmitter, $310; companion power supply, G4/226, $124.50. Sales tax applicable on both units.

A companion receiver is the G4/216.

For further information write for Technical Bulletin No. 96 to the Australia agents: R. H. Cunningham Pty. Ltd., 608 Collins St., Melbourne, Vic.

INEXPENSIVE AMPLIFIERS

National Semiconductors have released a family of inexpensive amplifiers containing separate controls and amplifier functions which allow for adding squelch, voice-operated transmit-receive (vox), automatic audio gain control, and speech compression. These may be incorporated in radio transceivers, intercom systems or tape recorders.

Information will soon be released (Application note AN-II presently indicates some of these applications):

(1) An audio amplifier whose gain may be remotely controlled by a d.c. voltage, or switched on and off by readily available IC logic elements.

(2) A speech compressor, capable of maintaining constant audio output or transmitter modulation level, regardless of the operator's distance from the microphone.

(3) A squelch preamplifier which turns itself off in the absence of a signal, and on when a signal appears. The circuit includes fast attack, to catch first speech syllables, slow release, to avoid frequent turn-off between words, and hysteresis, to minimise uncertain action when signals appear.

(4) A simple vox/mike preamp., similar to the squelch system, in which using a relay, the circuit can turn on a transmitter or tape recorder when a signal appears.

(5) A twin tee audio oscillator, with regulated output voltage.

(6) A modulated, 455 kc. signal generator, usable for aligning a.m. radios.

For further information contact Mr. J. J. Rutherford, Rutherford Electronics Pty. Ltd., 833 Doncaster Road, Doncaster, Vic., 3108. Phone 848-3033.

RESULTS OF VK3 DIVISION 160 METRE CONTEST

VK3 SECTION

	Number of Contacts with							Total		
	VK2	VK3	VK4	VK5	VK6	VK7	ZL	Contacts		
VK3APN	5	73	1	9	3	1	3	95	935	Points
VK3ATN	4	39	3	9	3	1	6	65	925	,,
VK3XB	3	70	1	7	3	2	2	88	835	,,
VK3RZ	3	67	–	8	2	–	3	83	765	,,
VK3NW	1	38	–	3	1	1	2	46	615	,,
VK3RJ	1	42	–	3	2	1	2	51	525	,,
VK3ACA	–	43	–	–	–	1	3	47	345	,,
VK3OW	–	40	–	–	–	–	3	40	300	,,
VK3ANH	2	20	–	5	–	–	–	27	270	,,
VK3YQ	–	33	–	–	–	–	–	33	165	,,
VK3KS	–	18	–	–	–	–	1	19	125	,,
VK3TB	–	2	–	–	–	–	3	5	115	,,
VK3AOW	–	21	–	–	–	–	–	21	105	,,
VK3ARL	–	20	–	–	–	–	–	20	100	,,
VK3BA	–	12	–	–	–	–	–	12	60	,,

Award for highest score in VK3 Section: VK3APN
Award for second-highest score in VK3 Section: VK3ATN

"DX" SECTION

	Number of Contacts with							Total		
	VK2	VK3	VK4	VK5	VK6	VK7	ZL	Contacts		
ZL1PL	1	11	–	–	1	–	–	13	455	Points
VK2GJ	–	11	2	3	–	–	–	16	400	,,
VK5KO	–	6	–	–	2	–	1	9	235	,,
VK7MR	–	7	–	–	–	–	–	7	175	,,
VK5BS	–	6	–	–	–	–	–	6	150	,,
VK5JG	–	6	–	–	–	–	–	6	150	,,
VK4QW	2	3	3	–	–	–	–	7	115	,,
VK7RY	–	4	–	–	–	–	–	4	100	,,

Award for highest score in contacts with VK3 stations: ZL1PL

CHECK LOGS

Check logs were submitted by VK-3XZ and VK3ANG.

LISTENERS' SECTION

D. Milway (Vic.)	730	pts.
E. Trebilcock (Vic.)	610	,,
P. Harris (Vic.)	510	,,
P. Mill (Vic.)	200	,,
P. Vernon (N.S.W.)	130	,,

Award for highest Listener's Score: D. Milway.

NOTES

(a) In some cases the points awarded are not the points claimed. The above results are corrected for errors, but such corrections have made no difference to placings.

(b) No logs were received from portable or mobile stations.

(c) A number of stations have made suggestions for future contests and these will receive due consideration.

DX

Sub-Editor: PETER NESBIT, VK3APN
32 The Grange, East Malvern, Vic., 3145
(All times in GMT)

ASSORTED

First up, news on coming VK0 activity from Rodney VK3UG (ex VK0CR): During 1968 the only Amateur on Macquarie Is. was David VK0IA, who has volunteered to remain there until March 1969. From late December '68 until March '69, Greg VK0KJ (VK7KJ) will also be active on s.s.b. Throughout this year until late December, Bill VK0MI will be active with 150w. of a.m. and c.w. Bands used will be from 80 to 10 mx. The QSL manager for all these stations is VK7KJ, who will be able to reply to any cards when he returns in mid-March. The exact operating times are not yet known, but Greg hopes to transmit on 14195 and receive on about 14210, so look out for him. (Thanks Rod.)

Zen XW8BX is operating just out of Vientianne and expects to be there a year or two more. He has had several offers from bods interested in being his QSL manager, but still prefers to QSL direct—his XYL likes collecting the stamps!

The VE6AJT/APV DX-pedition: Don and George hope to operate from CR8, VS5, Indonesia; then on to AC3, 4, 5 early in 1969, then on to West Africa where they hope to include EA9, 0. All QSLs and financial support (much needed) via VE6AO.

Ed KH6GLU is reported to be going to FW8 land, departing Jan. 29. Operation will be for 10 days on 80 through 10 mx. QSLs via Ed's home QTH.

8QALK (not a misprint) is Dave VU2OLK/GM3OLK, who is QRV from Male. Resident stations are 8QAWA (ex 4S7WA) and his XYL 8QAYL (ex 4S7YL). (Male is in the main group of the Maldives, north of the equator and in zone 22. It may count as separate from Gan (VS9MB) which is in zone 39.

George ZL2AFZ reports that he is going to Chatham Island for 3-4 weeks from Jan. 5. Other operators will be ZL1DS, ZL1IL and ZL1TU. Each operator will use his own call sign/C. Frequencies will be: 3525, 7015, 14025, 21025 and 28025 on c.w.; and 3825, 7090, 14125, 14250, 21350 and 28550 on s.s.b. All QSLs via ZL2AFZ.

Mick VP8KH will be going to Deception Island (South Shetland Group) for four months until early March. While he is there he will look for the logs of VP8IY who left there in a hurry when the Base was abandoned due to volcanic eruption.

Sint Maartin: The operators of the recent PJ0CC DX-pedition were W1BGD, W1BIH, W1EOB, W1FJJ, W1TX, K1ANV, W2ADE, K3NPV, W4GF, W4KFC, W4YWX, W4ZM and W6RR (certainly no shortage of operators). QSL via W2ADE, pse s.a.e./IRC.

Again from No Man's Land, W7ZFY aboard the USCG Cutter "South Wind", says his ship will join the VK expedition to Heard Island in March, and the team expects to be ashore for about one week.

KH6ZBF was unable to get a permit to visit Kure Island, but says he is going to try again next year.

Jack VK9RJ says that VK4HR, 4KS or 4PX may help arrange skeds. He should have his new quad in action soon and be QRV on 15 and 10 mx as well as 20 mx. Look for him 14160/170 Tuesdays from about 06z.

Up to date (Sept. '68) Prefix/Country/Zone lists, Country/Prefix/Zone lists, together with a complete list of International Prefixes may be had by sending 9d. and IRC to Short Wave Magazine, 55 Victoria St., London, SW1.

Nice Call Sign Department: 4M4AJ and 4M7AV were the contest calls of YV4QG and YV7AV. Other special contest calls were U1A, UP2A, UR2A, UV4H. 4A0IEC (WB2IEC) and XE0LOW (WB2GQK) were QRV last May/June, and will be there again this January.

Timor CR8: After 18 months of trying, VK8HA still expects not to make it until February or March.

BAND NEWS

OR4ES skeds DL0MB daily 21150 at 12z. Apparently operates from Jabal al Uwaynat in the Libyan Desert; will return late Feb. and reply to QSLs then.

BV2A makes a special lookout for VK/ZL stations daily 14025/030 at 09/10z. His QSL manager is WB2UKP.

TA3X is the second call sign of Lamar K7SAD/TA3AR who skeds his brother and QSL manager WA7GQA on 14210 Fridays and Sundays at 22z.

EA6AR skeds DL7FT and 3A2CN Sundays 14220 at 08z; also 21290 0830z if condx okay.

South Shetland Isls.: CE9AT is on 14185 every Friday at 2115z.

CR5SP and CR6IV have a sked 14170 Sats. 1415 ; also Suns. at 0530/0730z.

QSL MANAGERS

BV2A—WB2UKP	VK0MI—VK7KJ
EP2GI—GI3HXV	VP8DJ—VP8HZ
FB8WW—W4MYE	VP8HS—W2CTN
FG7TI/FS7—VE3EUU	VP8IA—VP8HZ
FK8BG—W5IXQ	VP8JB—VP8HZ
FY7YQ—WA4GQM	VP8JC—VP8HZ
HK0BKX—WA6AHF	VP8JN—VE2AGH
HS3TD—WA6CPI	VP8JT—VE1ASJ
KC4USX—K3UZM	VP8JX—GD3HQR
MP4TBO—G3YBO	VP8JZ—G3LEO
OK8AAE—OE1WO	VP8KD—K2JXY
OX5AY—VE3DLC	VP8KE—W4NJF
PJ3CC—W3AYD	VP8KF—G3TWV
PJ0CC—W2ADE	VP8KI—VP8HZ
PY0OK—PY2SO	VQ9GA—WA6AHF
PY0OM—PY2SO	XW8CS—VE6AO
UA0KIP—UW3FD	ZD9BL—WA6AHF
VK4EV—VK3AEJ	ZE5JJ—W6BAF
VK9XI—W2GHK	7Z3AA—K8YBU
VK0IA—VK7KJ	9U5CR—WB6HGU
VK0KJ—VK7KJ	9U5HI—WA2CRD

ZF1EP—SAE/IRC to Box 1647, Fort Meyers, Fla., 33902.

EP2BQ—New QTH: H. McQuillan, C/o. Dept. of Geology, Pahlavi University, Shiraz, Iran.

PY0DX via PY7ACQ QTH; PY0SP via PY7AOA QTH. All times in GMT. Pse SAE/6IRCs.

8QALK—Box 53, Bangalore 1, India.

VP8s FL, JG, JH, JI via BRS-26222, E. R. Chilvers, 1 Grove Rd., Lydney, Glos., U.K.

ACTIVITIES

As most of us know, David VK3QV is an enthusiastic 10 mx man. In an interesting letter he reports working KV4FA via long path at 13z, also hearing a W4 on long path at 1350z (see last month's 10 mx Band News for a description of 10 mx conditions). He says, "Before working KV4FA it was interesting to hear him working CT2AA, and the CT2 coming in both long and short paths. Under such conditions working these stations is difficult because of the strong QRM they are getting from both Europe and North America." David submits a list of many stations worked on 10 mx, including most call areas of Europe, plus many Asian and Pacific countries, and one very rare contact: VK7AB via short skip.

Welcome back to Al VK4SS. Al has also been busy on 10 mx, and sends in a list of countries worked in the past few weeks. All continents have been worked. Al says that this summer will see the best of 10 mx, although 15 mx should remain okay for a couple more seasons. Judging from the comments in Al's letter, and after a talk with David 3QV, it appears that anyone who plans to go for the five-band DXCC (described below) had better hop to it smartly, as 10 won't be good for DXCC much longer.

After reading the rules for the five-band DXCC, I know many of the 15 and 20 metre DX men will throw up their hands and say "it can't be done in VK." Why not? "Because you'd never have a hope of making DXCC on 40 or 80." Admittedly one would need to be a pretty hot shot operator to do it on 80, but it's quite possible on 40. Trevor VK2NS sent a list typical of what he has been working on 40 mx lately, containing some real beauties: Europe, Africa; you name it, he's worked it. While perusing the calls, one had to keep reminding oneself that they were worked on 40, not 20. Keep up the good work Trev.

A NEW AWARD—
THE A.R.R.L. FIVE-BAND DXCC

A brand new challenge for DXers comes into being on the 1st January, 1969—the Five-Band DXCC Award. This does **not** supersede the DXCC Award, but is in addition to it. **All** contacts must be made on or after 1/1/69.

The idea is to start from scratch and work at least 100 countries on each Amateur band from 80 to 10 mx, or any five other Amateur bands. (Active repeaters or translators may **not** be used.)

The rules are the same as for the basic DXCC award. Only QSL card confirmations will be accepted; and cards must not be for cross-band or cross-mode contacts. All legal modes may be used; there will be no mode endorsements.

Applications will be accepted only on the official entry form available from the A.R.R.L. at 225 Main Street, Newington, Conn., 06111, U.S.A. Each such form costs $10. This charge covers the cost of the award: a handsome engraved plaque, and the cost of forwarding the plaque and returning the 500 cards by first class registered mail. So, get those antennae up for 40 and 80 metres, and get cracking. Good luck!

SUMMARY

From this month on, the DX Notes will be slightly different; shorter, and with more emphasis on DX-peditions, etc. Activity reports are still (as always) welcome, but the type preferred are interesting experiences or reports of unusual conditions, not the long and generally repetitive lists of DX worked. All items should be received by the end of each month.

Acknowledgments to DX News, LIDXA, ZL2AFZ, G3UGT, VK3UG, VK3QV, VK3AQP, VK4SS and VK2NS. 73, Peter VK3APN.

CONTEST CALENDAR

7th Dec., 1968, to 12th Jan., 1969: Ross A. Hull VHF Contest (W.I.A.).
1st and 2nd Feb., 1969: John Moyle Memorial National Field Day (W.I.A.).
1st and 2nd Feb., 1969: 35th A.R.R.L. DX Test (Phone Section), first week-end.
1st and 16th Feb., 1969: A.R.R.L. Novice Round-up. (C.w. Section), first week-end.
15th and 16th Feb., 1969: 35th A.R.R.L. DX Test
1st and 2nd Mar.: 35th A.R.R.L. DX Test (Phone Section), second week-end.
8th and 9th Mar.: 32nd B.E.R.U. Contest (R.S.G.B.).

SOLID-STATE AIRBORNE TRANSCEIVER

A combined h.f./v.h.f. solid-state airborne transceiver with a total system weight of 44 lbs., developed by Marconi Co. Ltd., provides 40w. output on 28,000 discrete channels between 2.0 and 29.999 Mc. and 10w. f.m. output between 30.0 and 99.975 Mc. with either 25 kc. or 50 kc. bandwidth. Switches select d.s.b. or s.s.b. operation on the h.f. band and narrow or broad-band operation on v.h.f. Complete transceiver circuitry is housed in a short 3/4 ATR case.

(From Aviation Week and Space Technology, 5th June, 1967.) (Could make a popular "disposals" item.—Ed.)

OBITUARY

PHIL RENSHAW, VK2DE

On 16th November, 1968, there passed from the ranks of Wireless Pioneers one who did much to build up the world of Amateur Radio Experiments—Phil Renshaw.

I first met Phil Renshaw about 1912 when the Wireless Institute of N.S.W. was formed and through his efforts Wireless Amateurs became a united body. He was not very active on the air, but he did much to make the Wireless Institute an active organisation.

In 1922, when the Institute was formed into the N.S.W. Division of the Wireless Institute of Australia, he was the first Secretary of the N.S.W. Division, and was one of the signatories to the Articles of the Association.

In 1923 the Wireless Institute N.S.W. Division held an Exhibition in the Sydney Town Hall, and as Secretary of the Division he was largely responsible for the success of the enterprise.

He continued as Secretary of the N.S.W. Division until he became its President and in 1926 became Federal President of the Institute.

Some may remember him in the early days as a motor bike enthusiast, riding a big Red Indian cycle. In later years he was often heard on the air using his call sign VK2DE.

In early 1930, when the Wireless Institute was attracting Professional Radio men, it was decided to revive the Institute of Radio Engineers, which, at the time, was not functioning. In this, with others, Phil Renshaw played an important part and the Institute of Radio Engineers was re-born.

Phil will always be remembered, not so much for the noise he made on the air, but for his energy and his personality, which endeared him to all who knew him. His bright and cheerful nature made it a pleasure to work with him. His interest in radio continued until business pressure forced him to leave the hobby he so much loved.

He did not enjoy good health in later years, although he carried on as a Consulting Engineer in the city. So his passing removes yet another pioneer Radio identity to whom, we as Amateurs, owe so much.

—H. A. Stowe.

H. F. (FRED) TREHARNE, VK5QT

The death occurred recently of Fred Treharne, VK5QT, ex-VK2BM.

Fred's first contact with Radio dated back to the days of the crystal set and loose couplers, honeycomb coils, bright emitters, peanut valves, "Attwater-Kents" and the like, all well known to old timers in Amateur Radio.

In order to get on the air, Fred sponsored his sons Ross, who passed his A.O.C.P. exams at the age of 14, and, with the correct operation of his station guaranteed by his father, was licensed as VK2IQ, and commenced operation in 1934. Another son, Elgar, was also licensed soon after as VK2AFQ.

During World War II., Fred Treharne was active in the Civil Defence field as an instructor and as a warden.

When both Ross and Elgar showed signs of marrying, it became necessary for Fred to obtain his own licence. So at the age of 60 years, he decided to learn the Morse code, and having sat for the exam, was licensed as VK2BM and became a well known a.m. operator.

Fred was an active member of the W.I.A. in N.S.W., served on Divisional Council, and was President of the Division in 1947.

Interested in community affairs, a Justice of the Peace, recipient of a Medal from the King in celebration of the Sesqui-Centenary of N.S.W., H. F. Treharne will be remembered for his work in many fields. Among his other activities he found time to take an interest in the work of the Police-Citizens Boys' Clubs in N.S.W.

Prior to his retirement, Fred had been a school teacher after graduating in Arts from the University of Sydney, was at one time Secretary of the Sydney Conservatorium and was Superintendent of Music to the N.S.W. Education Dept. for many years.

After the death of his wife, Fred moved from N.S.W. to South Australia where his sons Ross (VK5IQ) and Elgar (VK5ED) were now living. At the age of 85, Fred (now VK5QT) was still active, visiting frequently, and still with his faithful old "Buick" with an unrestricted driving licence.

On 3rd September, 1968, he went to the local newsagent to buy a newspaper and was accidentally knocked down by a motor car while crossing the road, suffering injuries from which he died a few hours later.

Members of the W.I.A. and his many friends extend their sincere sympathy to his sons Elgar and Ross and their families.

W. H. (BILL) CLARK, Ll.B.

The N.S.W. Division suffered the loss of its Honorary Legal Officer recently with the death of William H. Clark, Ll.B., on 20th October, 1968, at the age of 56 years.

Bill Clark, an Associate Member of the Division for many years, had been its Honorary Legal Officer since 1957. During this period he had rendered invaluable service to the Division on constitutional and general legal matters. His advice to the Divisional Constitution Committee had resulted in a number of changes being made to the recently adopted Federal Constitution.

Bill was principal of the legal firm of W. H. Clark & Co., Sydney, and was a graduate of Sydney University.

The N.S.W. Division is very appreciative of the service rendered over the years by Bill Clark, and extends its sincere sympathy to Mrs. Clark and her three sons.

PRECISION D.C. POWER SUPPLY

The A & R Micropak Type PS85 is designed primarily for use with digital integrated circuits which require a supply voltage between 2 and 6 volts, but may also be used as a high quality power supply for any other purpose within its ratings.

Specifications

A.c. input: 105-130v. or 210-260v., 50-60 cycles.

D.c. output: 2-6v. 1a. max. 1.2a short cycle.

Load regulation: Less than 0.05% for full load current change.

Line regulation: Less than 0.05% for ±10% mains variation.

Ripple and noise: Less than 250 uV. peak to peak.

Temperature co-efficient: Less than 0.06% per degree Cent.

Output impedance: Less than 0.05 ohm from d.c. to 1 Mc.

Size and weight: 5½" wide x 7" deep x 2⅞" high.

Both Models PS85 and PS97 (2-15v. 0.4a) $85 plus sales tax if applicable.

HAMADS

Minimum $1 for forty words.
Extra words, 3 cents each.

HAMADS WILL NOT BE PUBLISHED UNLESS ACCOMPANIED BY REMITTANCE.

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FOR SALE: AR7 Receiver, complete with power supply and speaker in original rack. Boxes B, C, D and expanded E, $60. VK3VM, Ph. 211-7370.

FOR SALE: FL-100B five-band Tx, u.s.b., l.s.b., with spare 6DQ5, excellent condition, $275. Apache Tx, five-band, with SB-10 s.s.b. Adaptor, $130. National NC-183 Communications Receiver, 15 tubes, 540 Kc. to 31 Mc. and 48-56 Mc., $100. VK5OD, 2 Claring Bould Rd., Christies Beach, S.A., 5165.

FOR SALE: Lafayette HE-30 Rx, with product det., 2-speed AVC, Q-mult., stab .osc. voltage, $85; Leader LSG-11 signal generator, $19; xtals FT243: 7200, 8006.667, 8106.667 Kc., vacuum 7-pin min. 3985 kc., $2 each; new min. butterfly trimmers, 6.4 pF., 75c each. C. Hagoort, 1 Larkdale Ave., Paradise, S.A., 5075.

FOR SALE: Swan 240 Transceiver, alternator, spare, 12 volt battery with changeover system. 20, 40, 80 metre Neutronics Mobile Antennas. Kyoritsu SWR Bridge. A.W.A. RC Bridge. Advance Signal Generator. Taylor Square and Sine Wave Generator. Grundig GDO. Sundry microphones. Dozens of valves. Best offers any Item. Wal Middleton, VK3IT, 22 Belmont Road, Croydon South, Vic., 3136. Phone Croydon 72-34673.

SELL: Contax Base Station on 53.032 Mc., complete, $40. K. Pincott, VK3AFJ. Phone 25-5775 (Melb.).

SELL: Kit only, Heath Solid State Voltmeter, Model 1M16, $65. K. Pincott, VK3AFJ. Phone 25-5775 (Melb.).

SELL: Pye Low Band Base Station. Good condition, 3/20 in final, 25w., ideal for 6 mx net. Must sell, $50 o.n.o. Terry Mitchell, VK3ZZQ, 4 Grant Street, Newtown, Geelong, Vic. Phone 213920.

SELL: Re-built AMR200 receiver complete with 6 ft. x 19 inch rack. One piece 40 ft. oregon mast. Also many parts/tubes. M. Reiper, VK3DT, 29 Victor St., Beaumaris, Vic. Phone 99-1221 (Melb.)

WANTED TO BUY: General Coverage Comm. Rx with Amateur bandspread, for novice, AR7 or similar. Condition and price to A. G. Bryan, Power Station, Moorina, Tas., 7254.

SOLID-STATE TRANSCEIVER

(Continued from Page 9)

AVAILABILITY

The full kit for the i.f. board including all components for the amplifier, the a.m. detector, the noise limiter and the a.g.c. system is $28.50.

Boards alone are $2 each, while instructions, layout diagrams and circuit diagrams are $1 per set.

All are obtainable on application to the "business" end of the project team—VK3AFQ, at 4 Elizabeth St., East Brighton, Vic., 3187.

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TRAINING CONSOLES FOR C.W.

A new system designed for the U.S. Army figuratively closes the long loop of historic evolution from c.w. telegraphy to solid state avionics. Designed for the Army by Sylvania, the new system provides 24 training consoles designed to speed and automate instruction in Morse code. The system is controlled, of course, by an electronic computer.

(From Aviation Week and Space Technology, 5th June, 1967.)

PREDICTION CHARTS FOR JANUARY 1969

(Prediction Charts by courtesy of Ionospheric Prediction Service)